REMOTE IMAGING GROUP 29

NEWSLETTER NO.29 **JUNE 1992**

REMOTE IMAGING GROUP.....OFFICERS 1992

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CONTENTS

COMMITTEE		Inside Front Cover
FROM THE EDITOR'S DESK	James Brown	2
FROM THE MAKE-UP EDITOR'S KEYBOARD	Mike Goodall	3
FROM THE SECRETARY	John Tellick	4
CHAIRMAN'S WAFFLE	Henry Neale	5
METEOSAT DISSEMINATED AVHRR PRODUCTS	John Tellick	8
A STEP FORWARD IN TIME	Lawrence Harris	10
TRACK II - THE MOVIE?	Mike Goodall	13
A GUIDE TO WEATHER SATELLITES	Richard Osborne	16
WEFAX CARD FOR SATFAX SOFTWARE	Peter Williamson	27
A REVIEW OF THE TIMESTEP HRPT SYSTEM	Peter Hayes	33
COLOURING WXSAT PICTURES	Mike Goodall	43
ALL THAT'S VAS	Tom Glembocki	47
RIG - STATEMENT OF ACCOUNTS 1991	Mark Clarke	50
THE GIF PICTURE LIBRARY	Mike Goodall	52
THE SOVIET AND CHINESE SCENE	Peter Wakelin	53
KEPLER ELEMENTS	Max White	54
SOVIET REFERENCE ORBITS	Simon Goodall	56
SHAREWARE CORNER	Mike Goodall	58
MEMBER'S LETTERS		59
THE NEALE'S GUIDE		71
RIG AT RALLIES		72
RIG HELPLINES		73
RIG SHOP CORNER		74
ADVERTISEMENTS		76
NOAA PREDICTIONS		Centre Pages

Front Cover Photograph: HRPT image of Italy by Marciano Righini, I4MY (Whole image together with other Marciano HRPT images available on GIF Library Disk No.13).

Centrefold image: The two smaller pictures relate to the constructional article by Peter Williamson. The one is of the populated PCB as seen from above, though constructors may find an alternative mounting of the gain pot would provide easier access when it comes to setting up. The other picture is an off-screen shot of a NOAA visual channel image of the east coast of Australia, with the 64 level grey scale seen. Which way you view this picture depends upon whether you are living in the northern or southern hemisphere.

The other picture is an example of yet another way of getting hard-copy from satellite image files. It was sent to us via Graham Smith, from John Willis of 'Laserlines Ltd', Banbury. He uses a Sandpiper turnstile aerial, Dartcom receiver and Timestep software, on a home-brew 386SX IBM compatible computer. The printer was a Lasertechnics DIR grey scale printer using 3M dry silver paper (see Graham Smith's letters), and a helium/neon laser. The picture is part of a NOAA pass last November.

FROM THE EDITOR'S DESK

JAMES BROWN

Well, here we are passing another milestone in the life of RIG -We are starting on our eighth year of the magazine! After Henry's 'Invitation' issue, June 1985 saw our first proper edition, and a membership then of some 350 paid a £2.00 subscription and got a 16 page magazine! NOAA's 6 7 & 8 were blasting through the ether, as were METEOR 2/10 and 11 together with the much loved METEOR 30. The main issues of the day revolved around sorting out the problems with frame-store boards and improving picture contrast.

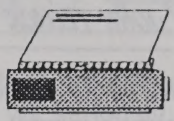
It is worth comparing that with our group now, with over a thousand members world-wide, a magazine that is constantly pushing the page limit, and hitherto unheard of notions of amateur reception of HRPT and METEOSAT Primary data. It makes you realise how fluid and progressive is the world of remote imaging.

We are grateful once again to our contributors to this edition. Amongst other items, we hope that the smell of solder flux will lead to the sweet smell of success and the satisfaction of having completed a project and actually done it yourself. We also have the confessions of a frame store man who's been computerised, and more bulging, informative, letters which look suspiciously like articles...

If we have looked back, and seen something of what's on offer now, what does the future hold? EUMETSAT have plans for a new generation of geostationary satellites starting in 1998 which will be spin stabilised, instead of the conventional 3 axis method, and will have a new visible sensor capable of 1km resolution. Already the next generation of sophisticated graphics displays are coming down in price, almost at the same rate as the processor speed of computers is increasing. More immediately, as far as the next edition of our magazine is concerned, we hope to look at the implications of the WARC decisions with regard to frequency allocations for the satellite community, and how our hard-ware can fight back, frame-store buffs will find a project to temp them, and just when you thought it was safe to put your wallet away, there will hopefully be a review of Timestep's new PDUS system which can only really be described as stunning. You'll have to wait until September though, so enjoy the Summer! JAMES BROWN

FROM THE MAKE-UP EDITOR'S KEYBOARD

MIKE GOODALL



Well it looks like we've cracked it at last. The March edition went out on time, and this one should be with you at the beginning of June. Thanks to all those of you who sent in your copy for articles early. It really does help, not to have all the make-up work to do in the last few weeks, but to be able to spread it over a couple of months.

Below are the Deadline dates for the next 4 issues, but remember, as we are getting far more articles sent in than we can possibly print in our small Newsletter, the earlier you send in your copy, the more likely you are to see it in print!

Cover date of Issue	*Deadline for Copy and Adverts*
SEPTEMBER 1992	1ST AUGUST 1992
DECEMBER 1992	1ST NOVEMBER 1992
MARCH 1993	1ST FEBRUARY 1993
JUNE 1993	1ST MAY 1993

These dates will be rigidly adhered to and there will be NO exceptions.

Also remember that Members Private Advertisements are *free*. If you have some RIG-related redundant equipment for sale, send in the details to James. The piece of equipment that has laid in the corner of your shack for years, may be just what another member is desperately seeking for!

PLEASE REMEMBER... SEND ALL COPY FOR ARTICLES, READER'S LETTERS, ETC. TO JAMES BROWN. I only deal with the RIG Gif Library and Trade advertisers' copy on a direct basis.

Stop Press...

With Timestep launching their new Meteosat PDUS system, the price of their APT equipment has been drastically cut.

PCSAT3 is now £49.95 and PROSATII is now £120.00.
See Rig Shop Corner.

FROM THE SECRETARY

JOHN TELLICK

Well after a year of resisting Henry's persuasions I have given in and I am now your new secretary; a job I've been doing in a small way for some time. At the moment I am also helping Ray Godden with the members survey. Thanks to all those who added further comments, I'm busy reading through them now.

What I would ask for please, is more feedback. Are we giving you what you want? What could we do that we are not doing? What are we doing that you do not want?

It takes considerable time and effort to run RIG these days as our two new committee members, Peter Wakelin and Chris Kaley are about to find out.

Our 6 weekly committee meetings run to well over 4 hours and our last two have had 27 and 24 items on the agenda respectively! Not to mention the hours on the phone or dealing with correspondence. This is not a complaint, we enjoy doing it, hence the call for feedback.

CALLING ALL SCHOOLS

As you might have seen from the Newsletter I am also Schools/Education Co-ordinator. Well I want to hear from you. What can we do for you? We have many schools as members, and I'm sure many members would like to hear about your satellite activities. One thing I would like to do is extend the Schools Helplines.

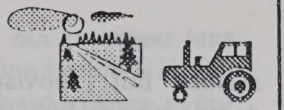
As you will see from RIG 28 all the contacts are in the south of England. So how about it all you teachers north of Watford with practical experience? Would you be willing to give advice to schools in your area just starting up? If so let me know and we can set up a UK-wide directory. It often helps if you can talk to someone who's been there before. Maybe you do not have too many problems, again let me know.

Two new ideas are currently being considered, the setting up of local 'member get-togethers' and a 'RIG weekend'. More about these when details have been discussed.

'That's all folks', JOHN TELLICK

CHAIRMAN'S WAFFLE

HENRY NEALE



It was very nice to meet some of you at the two rallies which we attended in March. It was also nice to have a small break before we seriously got stuck in to the next session. The AGM was not well attended, as usual, but that could change in the future as you will see later. There were some changes on the committee with Gordon Flemming, Peter Newman, Mike Coombs, Colin Hall and Des Watson not seeking re-election. The remainder were re-instated and two additional members were added. They are Chris Kaley from West Drayton and Peter Wakelin from Ascot. I shall be watching their talents to find a suitable job for them in the future! In the meantime they will have to join the scrum that is sometimes called a rally, to get really initiated! At our first Committee meeting the main alteration was to promote John Tellick to be full Secretary. He's already started on me by claiming a page in the Newsletter to go with the job! Don't overload him with problems to start with - that will come later!

One constructive thing that did come from the AGM was that of Regional Reps. or more probably Regional Contacts. It was envisaged that if several people (scattered around the country) could make themselves available as points of contact, a local network could be initiated, for the mutual self help etc., of local members. To get this idea of the ground I would like some of you (especially those of you with working systems of both Meteosat and the Polar orbiters) to offer your services, preferably in writing. The next Newsletter could then contain a list of those offers together with their locations and phone numbers. This will take a little time to organise and will depend on your response. I envisage that these regional groups would meet approximately every 3 months, or as desired. It would be up to the members in the local area to contact their Regional Rep to get further details. The Regional Reps could then register all those contacts on a mailing list and advise them what is planned. Perhaps we could help if they were not too far away. Its just an idea at present, and we are open to (realistic) suggestions. Seriously consider this idea, and if you think that you could foster a small group, let me have your details to include in the next issue.

Taking this further; there is the prospect of a RIG Weekend! What the XYL's would think of it is open to speculation. We are thinking along the lines of a mini conference which would feature lectures and working displays. It would all be done at a leisurely pace. Perhaps there would be an few trade

stands, but I envisage it more like a colloquium with manufacturers demonstrating PDU, HRPT and other products. Lectures would be on topical subjects so that we would all know what *should* happen, and a workshop to find out *why it didn't!* At the present it is only a germ of an idea, but it could happen next year! If it does, perhaps that is where the AGM could be held in future!

Its difficult to get perfect staff on the wages that we pay, and it would appear that some of the one Metre dishes were dispensed with the wrong length of feedhorn legs. To make certain that yours are correct, check that the overall length is 53 cm - then you are correctly focused. If they are only 47.5 cms - you've got the ones for the 90 cm dish which are shorter! Let me know if you have a problem. It will still work but the gain is reduced.

During the past months I have frequently been asked for ready built receivers, and you will know that we have not been able to supply one. That situation now changes, because I have looked around the manufacturers and come up with the following two items. These do not mean that we reject other products, but are merely adding to our range. First a bargain, but one each to paid up members only, on a first come first served basis. A certain well known manufacturer found that he had rather too many 2 channel receivers in stock. Today that means money tied up. He suggested to me that RIG might be interested if the price was right. I negotiated with him, and the committee endorsed that decision, and I can now reveal that a very small Timestep receiver is available for the remarkably low rally price of £55. It is a good receiver in its own right, but I envisaged that it could be used with a Downconvertor to release your Dartcom scanning receiver to do the job that it was designed for. They are very small and it would be difficult to modify them. They come crystalled for 137.5 and 137.62 Mhz. and only require 12 volts to give out low level audio. Channels are switched by grounding one connection. We also have negotiated a special deal on the Timestep Proscan Receiver. This has sold for nearly £250 previously, but RIG can now offer it to members for a rally price of only £160. It has 8 channel positions, of which 6 are crystalled. It requires a 12 volts supply. This one does have higher level audio output so you can listen directly to the signal. Both receivers have 2400 tone detectors for the squelch circuits and shouldn't lock on extraneous signals. The later scans very quickly. Both are very sensitive, but have "F" connectors on the aerial input.

It amazes me, that during this recession, I am handling such a large amount of money through the RIG office. It would appear that RIG type equipment

is now classed as essential! It is a poor week if I send our treasurer less than £1000! Perhaps it will fall off in the rally season. One problem is that when you sell an item you have to re-order it. I try very hard to keep every line in stock and am successful 95% of the time - but not always! One final additional stock item to advise you about, is a low priced Crossed Dipoles Antennae that we are to stock. It consists of droopy crossed dipoles and crossed reflectors, plus a phasing section. The rally price is £18. If I haven't saved you money in this Waffle, then you shouldn't have been so eager and already bought one!

In addition to the above savings, more follows. I have just been informed by Dave Cawley that Timestep has Digital Imaging Systems in Korea and Australia, plus literally dozens in America. In the UK there are only 3 of his systems at present. To encourage the UK market, Timestep is offering the following:- PDUS Receiver, card and software for only £499, also their HRPT receiver, card and software, again for only £499. These two special offers are for a limited period, one per member and the prices include VAT and P&P for the UK only. Overseas members will have to enquire direct to Timestep for the exact price. The RIG preamplifier has been tested with this combination by James Brown and appears to work extremely well. He is using a 2 metre dish but I am advised that a 1.6 metre size is all that is required. I have some 1.6 metre dishes in stock, but I am expecting a rush now! Further advice can be obtained from James Brown (for PDUS) or Peter Hayes (for HRPT). There have been rumours that data (Wefax) might be encrypted. Gordon Bridge, Meteosat Mission Manager, stated that there wasn't any intention of encrypting in the foreseeable future. Any further additional news, if there is any, will be included in future Newsletters.

I thought that the publication of the "Neale's Guide" in the last Newsletter would have provoked a lot of reaction. "I wouldn't pay that" or "that's a bargain" are the sort of comments I was expecting. I certainly have not had any, and I don't know if it was of any use at all. If you found it useful, or you disagreed with the figures, or even did a deal at a similar price, I would like to hear from you, so that we can decide on the guide's future.

Just a final note about not speaking too soon. I mentioned last time that Framestores just go on, and on, etc. I wish I had kept my mouth shut! My framestore packed up about 10 days after writing that, and I just have not had a chance to repair it. If I took notice of the "Guide" perhaps it would be working by now and - you never know - in its own case? If that happened, the Dartcom receiver would probably want a case too!

That's three pages, and from the views expressed to me by a few, three too many! I have been warned that the Waffle could be severely curtailed if only by lack of physical space. If I over-run, the print size might be severely reduced - sounds painful!

Best wishes, Henry. *[I warned you! Mike]*

METEOSAT DISSEMINATED AVHRR PRODUCTS

John Tellick

On 1st August 1991 EUMETSAT began the transmission of some WEFAX AVHRR products on an experimental basis to METEOSAT-4 for general dissemination to the user community. These products, created in CMS Lannion, France, are based on a European area Advanced Very High Resolution Radiometer (AVHRR) image.

Instrument description

AVHRR information is provided by the NOAA polar orbiting meteorological satellites which travel around the earth in a sun-synchronous orbit with a 102 minutes period and an altitude near 850km (i.e. approximately 14 revolutions per 24 hours). The two operational spacecraft cross the equator over western Europe during the night and afternoon (NOAA-11) and during the morning and evening (NOAA-12).

The AVHRR instrument measures emitted or reflected radiation from the earth in 5 spectral channels, with a horizontal resolution of about 1km. Channels 1 and 2 are visible (0.58 to 0.68μm) and near-infra-red (0.725 to 1.1 μm) respectively. The 3 remaining channels are located in the thermal infra-red spectral region (3.7. 11 and 12 μm).

The interpretation of 3.7 μm pictures during the day is difficult because they include both solar radiation and emitted terrestrial radiation. They do, however, allow the separation between fog and low level clouds near the surface at night.

The AVHRR data is re-mapped on a polar stereographic projection. Several successive satellite paths can be used to create the final image.

Night-time cloud classification

One product is derived using an automatic cloud classification scheme for night-time imagery, based on information provided by the three infra-red channels. The other product is derived purely from the channel 3 image data.

The next step in the processing performs a spatial smoothing of the classification results. This step is important to reduce noise in channel 3, which may produce mis-classification between clear and low clouds. It also corrects for a general estimation of apparent cloudiness produced by the cloud detection method, when compared to interpretation of the same IR

scan by eye. A final processing is then performed to provide the necessary format for METEOSAT dissemination. The following 5 classifications are produced.

Clear sky, low clouds, thin cirrus, other clouds (which groups all clouds which have not been classified in above classes, and Coastline - a fixed grey level given to coastlines or pixels which have not been processed (e.g. pixels containing sunglint or pixels outside the scan path).

Channel 3 imagery
The input for production of this image format is the same as that used for the cloud classification. The 3.7μm IR channel data used is expressed in terms of brightness temperature. For pixels illuminated by the sun, correction is made for both emitted and reflected radiation. The grey level scale used for image enhancement corresponds to the linear transformation of these brightness temperatures into counts between -30 +30 Celsius. These value may be modified with experience.

Projection
Products are mapped on a polar stereographic projection and have a spatial resolution of 4 kilometres at 45° N. Image pixel columns are aligned parallel to the 0° meridian.

Schedule
At the present time WEFAX AVHRR formats are relayed by CMS Lannion to METEOSAT-4 at 0726, 1026 and 2226 UTC on channel A2.

FOR SALE...

Mr Guy Martin has advised us that he has a colleague who has some Muirhead D400 Transmitters (x30) and D401 Receivers (x15-20). They are available for £10.00 each. The receivers are either /B which run at 500 RPM or /D at 180 RPM. Most of the TXs are less lenses, but the motors are usually E49/A6 (1500 RPM from 240v). The /D receivers contain E49/D3 motors (3000 RPM from 115v). The motors may be fed with any frequency within reason, and the TXs have a super photomultiplier tube included.

Any interested members can contact Guy for further information:
14A Arthur Road, Biggin Hill, Westerham, Kent, TN16 3DD
Telephone: 0959 71066.

A STEP FORWARD IN TIME

Lawrence Harris

During the last twenty or more years, while working at various government scientific research laboratories, I have met a number of equipment manufacturers involved in the 'space' industry. I had the opportunity to visit places like Marconi in Portsmouth who were closely involved in the production and testing of the British satellite Ariel 6 (UK 6). Many is the hour that I have wandered around a 'clean room' wearing the obligatory white coat. So when the opportunity arose for me to visit Timestep Weather Systems in the village of Wickhambrook, some miles from Cambridge I was delighted.

I first heard about Timestep in the mid-eighties when I left professional satellite work to return to Plymouth and then while embarking on a career in training I decided to set up an amateur receiving station. I sent off an S.A.E. to Timestep and other suppliers and waited patiently - no response. Similar inactivity on Timestep's 'phone quickly earned them a reputation! Other companies were also tardy in their response to queries about equipment.

Bench testing

Back to the present: after travelling 322 miles I arrived at Dave Cawley's house and a few hours later joined his staff at work. My first impression was how reminiscent the development room was of my old work place at the Rutherford Appleton Laboratory near Didcot. Looking around the large area I noted various items of test gear including a new Marconi Instruments signal generator (10kHz to 2.7gHz) which would have cost some £10,000. This indicated to me the seriousness with which their development work is treated.

Other equipment included receivers, a DAT player, and a spectrum analyser. There were also a number of computers, mostly undressed, including a '486' fitted with a 20 inch monitor! Have you ever seen a 20 inch monitor? On this screen was a high resolution infra-red image from NOAA, of the UK and it really was stunning. I had brought with me some satellite data tapes containing recordings from GOES in which the software was synchronising slightly askew. No-one else had reported this problem to Timestep although they have sold many copies to the USA! The GOES transmission format has changed slightly, hence the problem. The resident programmer Peter Arnold dealt with it while I was there.

The house is almost completely surrounded by dishes, yagis and other antennae so I took some photographs. It made my own dishes and antennae pale into insignificance! There were three very large dishes and collections of smaller dishes ready for sale. Timestep are continuously updating software and developing new programmes, one of which is a new tracking programme called TRACK2. It was running on a '286' and indicated FENGYUN 1B was coming up. There has been no APT from FENGYUN for several months but Timestep were among the first to have detected HRPT transmissions from it and so a dish was moved to point at the satellite but no transmissions were detected on this occasion.

Timestep have a regular stream of visitors and one gentleman came from Seoul in Korea, bringing with him a dat tape containing APT data. DAT (Digital Audio Tape) is relatively new but Timestep have bought a dat machine and were playing back the NOAA data.

Some of the volume production of PCB's and component construction is carried out in a local 'cottage industry' that Dave took me to see, just a few miles away. When Timestep have produced the 'final' board their volume production moves to this company who manufacture the boards from scratch and do all of the etching and assembly work. I was shown the large machinery used for the various processes and had a chance to look carefully at the sample decoding board which was immaculately produced.

HRPT and PDUS

The next wave of consumer demand amongst those who have spent much time using APT equipment and who want to go 'all the way' will undoubtedly be the 'final frontier' - the installing of high resolution picture telemetry receiving equipment, capable of receiving and decoding the digital data streams from the NOAA and METEOSAT satellites.

After showing me their latest offerings in the APT computer processing market - PROSAT 2 - for which I have submitted a review to Short Wave Magazine, we turned to the new technology. Timestep are now routinely obtaining HRPT data from the NOAAS and FENGYUN (when turned on) and have developed a METEOSAT Primary Data User System (PDUS). The software for PDUS was not officially complete at the time of my visit and so was not expected to be ready for marketing until about March (Dave said February - but I suspected later!) *[February it was!...Ed]* Prices were yet to be determined. Despite that, Dave showed me a live METEOSAT digital image being received, and what is there to say? It was immaculate! The new HRPT system for NOAA is being retailed now and I was surprised to

hear just how many systems they have sold. People simply come along - often from abroad - see the demonstration, and...! Recession? - What recession!

As with the APT systems there is a direct temperature read-out, and an incredible infra-red image of Iceland was produced from their collection. It is worth mentioning that the amount of data that comes with HRPT is colossal. Some 10Mb per channel, and there are five operational channels, meaning a potential 50Mb (and more) file!

The infra-red image of the UK on the large monitor showed several heat 'islands' mostly towns. Rivers were visible due to the thermal differences, and the intense heat output of a power station based on the north-west coast of Wales was seen.

The future

Without a doubt the entry point for those taking an interest in weather satellite picture reception will remain the construction or purchase of APT equipment. This provides almost all the information about the world's weather that one can ever want to know. The NOAAS, METEORS, OKEANS, and METEOSATS will continue to provide first class data for all of us.

However, there are many people who enjoy the thrill of having the best, and there are institutions who see their status reflected in having the latest gadgetry, and likes of me who appreciate the tremendous work that goes into developing systems that only a year ago, or more, were totally unavailable at anything like domestic/hobbyist prices. For all these categories we are entering the age when microelectronics is providing us with unparalleled facilities.

My thanks to Dave Cawley of Timestep for his kind invitation to visit his development workplace.

FOR SALE...

Martelec MSG20 Frame Store for BBC computer with GRACE rom software. Capacity 2 images 512x512x128 or 8 image film mode. Mint condition, in manufacturer's case. £175.00
Ian McWhirter. 071 359 0397.

TRACK II - THE MOVIE?

Mike Goodall

TrackII is an inexpensive satellite tracking program from the Timestep studios. It has obviously been designed to give instant information of the kind most regularly needed. For example... is there a satellite transmitting over your site? and if not when will the next one be due?

There are two main sections: Firstly the World map, with the 6 selected satellites displayed, together with a lower portion showing information, such as satellite positions, and most important, how many hours, minutes and seconds before they arrive. The second section is a screen display showing forecasts for the same day, or any number of days into the future, for the selected satellite. In the printer mode, it produces a neat printout of the satellite times etc. on your dot matrix or laser.

Upon executing the program, the World map appears and the 6 selected satellites are listed at the bottom, with their info. You then press escape, and the program goes into its real-time mode. The satellite times and positions are displayed at the bottom of the screen which updates every second, and the footprints and paths on the map update every 6 seconds. In the Fast Forward mode (f4) the screen updates the satellite movement many times faster than real-time. The speed of this varies with the type of computer you are using. Ones fitted with a co-processor being much faster.

There are 7 pull down menus on the top line, of the familiar standard Timestep design.

Satellite
New Sat: Adds a new satellite to your selection in the lower section.
Remove Sat: Removes satellite from the lower section.
Swap Sat: Allows you to swap the last of the 6 displayed satellites from any one in your database list.

Display
Trace Off: Disables satellite ground track on World map.
Footprint Off: Disables the footprint ellipses on map.
Label Off: Disables name of sat labelled against footprint on map.
Beeps Off: Disables beep telling you when sat is being acquired or lost over the horizon.
(Personally, after using the program for some time, I cannot imagine why anyone should want to disable any of these useful functions!)

Update
Allows you to automatically update your satellite and Kepler database with 2-line or Amsat format files (obtainable from the Timestep bulletin board, which is updated each week direct from the States (the Rig BBS is also updated from these Timestep files). It can also allow you to export the file in the alternate mode (i.e. 2-line to Amsat or vice versa), as well as automatically updating your Prosat II element files.

Table
Quick Schedule: Provides output to screen or printer of the predicted rise and set times of a selected satellite, azimuth and maximum elevation, which shows at a glance how good the pass will be.
Full Schedule: Provides output to screen and/or printer of the prediction of the selected satellite. It shows rise and set times, and every minute in between, with azimuth and elevation.

Position
Select: Gives you the option of selecting up to 6 sites for your viewing location.
Edit: Allows you to edit any of the above; inputting your Latitude and Longitude.

Clock
Set Time: Type in accurate time.
Set Date: Type in date.
Fast: Fast forwards the real-time display - 1 min in 1 sec on my 16MHz 286 with co-processor.
Slip: Halts display and stops time. Escape restarts.

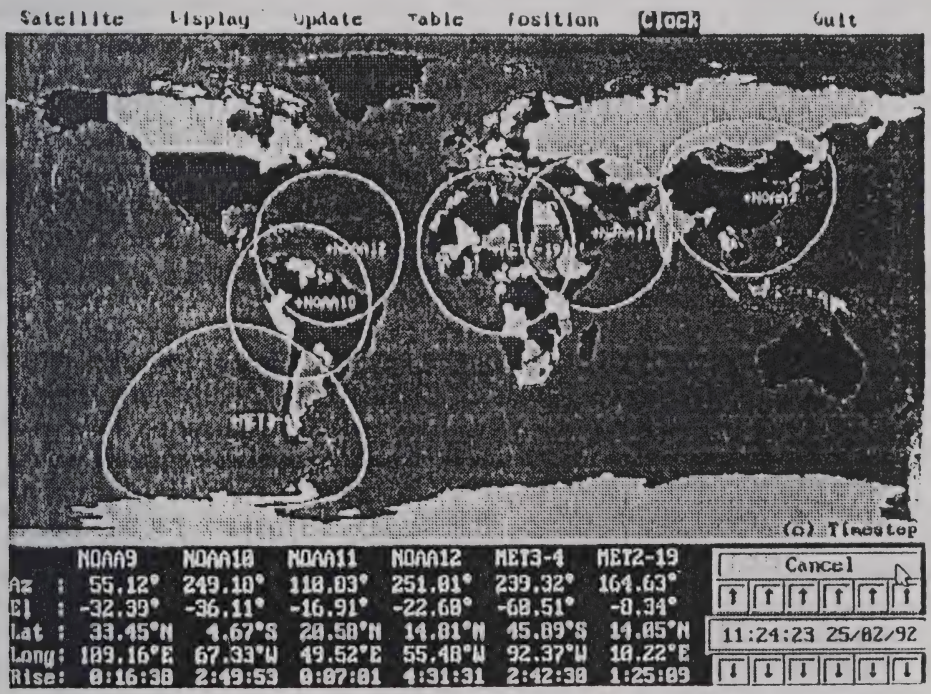
Quit
The normal No, Yes, Info format.

As well as the features above, the current version includes an ALT/P option which initiates an HP Laserdump to your printer. (An update for existing users will be issued soon.)

Overall, I must say, that out of all the tracking programs I have seen and experimented with, Track II seems to be the most easy to use, and in this respect is ideal for beginners, as well as pros. It is difficult to criticise this excellent program, other than to say that it can be annoying having to swap satellites from your database to the lower screen, when you wish to view more than the 6 selected. During the winter months just past, there were

only 4 Noaas and 2 Russian Mets on, so 6 sats selected was fine. However, in the Summer months when more Mets will probably be re-activated, 12 would probably be more useful. An option of another 6 satellites already selected and automatically swapped for the existing ones, with say, a press of the Alt key would certainly make it unbeatable for me. (I understand that this update will be issued in a few months time.)

Although there are other tracking programs that have multiple map options, and bulls-eye displays, etc. (such as the new PCTrack2) they are nowhere near as easy to use. If instant information is needed Track II seems to be the answer. It can also be executed from the Prosat II 4-square menu page, if you have the Prosat II upgrades. It is available direct from Timestep at a discount Member's price of £24.95 (see Timestep advert at the end of this newsletter).



The main Track II map screen.

A GUIDE TO WEATHER SATELLITES

Richard Osborne, GW4BVT

This article describes some of the techniques required to make display image transmissions from weather satellites. It is not intended to be comprehensive but I hope that it will useful to some readers.

I have broken the article down into major sections starting with reception and moving through demodulation, display, interpretation and image enhancement. It is based on my own experiences and referral to published texts. An acknowledgement to a previous publication is made by a number inside square brackets [.] and the list relating to these numbers appears at the end of the article. The article has been restricted to covering the secondary user formats of analogue APT and WEFAX only and not primary digital data.

Receiving Polar Orbiting Satellites

Polar orbiting satellites transmit APT signals between 137 and 138 MHz. They use circular polarisation where the plane of polarisation of the transmitted signal rotates once through 360 degrees for every complete electro-magnetic cycle. The use of linear polarisation would cause problems because the motion of the satellite can cause the plane of polarisation of the transmitted signal to vary as seen from the receiving aerial. The plane can rotate in one of two senses, these being left and right hand circular.

To obtain the maximum signal from the satellite, the receiving aerial must have circular polarisation with the same rotational sense as the transmitted signal. For all current NOAA and Soviet satellites, this is right- hand circular. The latest Chinese satellite, Fung Yen, has left hand circular polarisation. The natural aerial is a helical type wound with a right-hand spiral. However. to obtain true circular polarisation, about five turns are required which makes the aerial fairly directional and it would need to track the satellite. To avoid the need for tracking, an omnidirectional aerial is required and typically, this consists of a crossed dipole pair. To obtain circular polarisation, a phasing harness is required to delay the signal from one of the dipoles by 1/4 cycle with respect to the other [1]. Ideally, each dipole should have a balun to give the best match to the harness. Note that if the phasing harness is wired incorrectly, the polarisation sense will be wrong. This will result in fading especially when the satellite is almost overhead. When the satellite is at lower angles, the pure circular polarisation can become distorted so even a wrongly wired aerial can pick up a reasonable signal.

The performance of a simple pair of crossed dipoles can be improved by placing a pair of reflector dipoles below them to act as an artificial ground plane. If the pairs are separated by 1/4 of a wavelength then, theoretically, a hemi-spherical vertical radiation pattern will be achieved with constant gain from the zenith to the horizon. However, a pattern which gives more gain at lower elevations than overhead is likely to be more useful. The idea is to give the highest gain where the satellite signal is weakest-at the horizon-falling off overhead where the signal will be strongest because the satellite is closer. This can be achieved by increasing the spacing between the main and reflector dipoles to 3/8 of a wavelength [2].

A problem that I have encountered with a crossed dipole aerial is fading of the signal when the satellite is at a low elevation. I receive a clear signal when the satellite pops up above the horizon and it then fades and produces bands of noise. This is caused by destructive interference between the signal received directly from the satellite and another which has been reflected off some nearby object. As the satellite rises, the relative phases of the direct and reflected signals change causing the signal to rise and fall in strength. If you have this problem, establish the bearing of the satellite at the time of fading by examining the received image and then look outside to see if there is a potential reflecting surface. In my case, it was a flat felt roof just below the aerial. The first course of action is to change the height of the aerial to see if it reduces the fading. Don't be afraid to lower the height because I found that although the overall coverage was reduced slightly, the fading disappeared almost completely. If a change of height doesn't work then moving the aerial is probably the only course of action.

I use a pre-amplifier mounted just below the aerial. Fortunately, I do not suffer from any strong signal interference from pagers. If you do have pager problems, do not fit a pre-amp until you have cured this or it will only make the problem worse [3]. A possible alternative to the crossed dipole is the quadrafilar helix which is described in [4]. This consists of four helices on a common axis set 90 degrees apart. Unfortunately, I have no information on actual performance. If you want to receive a satellite at extreme range, use a directional aerial such as a Yagi, tracking the satellite by hand if need be. Although the aerial should be resonant at 137 MHz and have circular polarisation, a spare two metre beam will do the job almost as well.

Receiving Geostationary Satellites

Geostationary satellites transmit on frequencies of 1691 and 1694.5MHz with linear polarisation. The most common aerials are parabolic reflectors with a feedhorn at the focus, corner reflector and loop Yagis. When a loop

Yagi reaches a certain length, the increase in gain is very small if the length is increased further and it is then better to stack them [5].

Modulation of Received Signal

The NOAA polar orbiters transmit images to secondary users with the APT (automatic picture transmission) format. Remarkably, this has remained unchanged since the early 1960s.

In this format, the varying radiation intensity, detected as the satellite scans the ground underneath, is converted in the satellite into an analogue baseband video signal. There is a limit to the maximum rate that this baseband video signal can vary which corresponds to a maximum modulation frequency of about 1.5kHz. This video signal is used to AMPLITUDE modulate an exact 2.4kHz sub-carrier. The AMPLITUDE modulated sub-carrier is then used to FREQUENCY modulate the main carrier in the 137MHz region, with the deviation of the main carrier varying according to the amplitude of the sub-carrier. The frequency deviation for peak white (maximum possible amplitude of baseband video signal) is 17kHz. For black, the sub-carrier does not disappear completely but retains a level about 5% that of the peak white value. This residual level enables a demodulator to always have a sub-carrier tone onto which it can lock.

The Meteosat geostationary satellite transmits with WEFAX (weather facsimile) format. It uses the same 2.4kHz sub-carrier and double modulation technique as APT although with a much higher carrier frequency. However, the frequency deviation for peak white is only 9kHz which results in a lower audio output level from the receiver compared to APT. Also, the WEFAX format has start and stop tones to define a picture frame.

The Soviet satellites observe the spirit of APT but certainly not the letter. The sub-carrier is NOT an exact 2.4kHz and can vary between satellites. One that I picked up at random had a sub-carrier frequency of 2.385kHz. (However, the latest Meteor satellite, MET3-5, does have an exact 2.4kHz sub-carrier). In addition, the carrier modulation levels can be erratic with a black portion of the picture falling to near 0% causing the sub-carrier to disappear almost completely. If the receiving equipment relies on the sub-carrier for timing in decoding the image, this can cause the received image to distort or be ragged.

Demodulating the Signal

The output from the FM demodulator in the receiver is an amplitude

modulated 2.4kHz carrier. To achieve the best signal to noise ratio, this output needs to pass through a band pass filter to remove unwanted out of band noise. Like any AM signal, the 2.4kHz carrier will have sidebands extending out on either side up to the maximum image modulation frequency of 1.5kHz. Thus the filter should have the passband centred at 2.4kHz with a passband of +/- 1.5kHz. The sidebands need to be passed through with little attenuation or image resolution will be lost.

The next step is the recovery of the image video baseband signal from the 2.4kHz carrier. As with an ordinary AM signal, a diode detector is normally used. However, as the maximum video frequency is more than half the carrier frequency, a full wave diode detector is needed to extract the video envelope without losing information. To avoid problems with voltage drops across the rectifier diodes, a precision rectifier arrangement based around an op-amp is normally used.

The resultant video baseband signal should now go through a low pass filter to remove the frequency components of the carrier. The ideal requirements of the filter are exacting as it needs to pass frequencies up to 1.5kHz without attenuation and yet suppress the carrier at 2.4kHz sufficiently to avoid 2.4kHz ripple on the video signal. I believe that NOAA recommend a 7 pole low pass filter. I am lazy and have only fitted a four pole (two op-amp stage) filter which reduces the carrier by about 20 dB relative to the video signal.

In testing the filter, I discovered that it must be designed with the correct step response as well as the wanted frequency response. If the step response is incorrect, then an effect similar to ghosting on a television picture may occur as the viewed image changes abruptly from light to dark or vice-versa. This is caused by the filter ringing or overshooting as it receives an abrupt change in level. I found the effect most noticeable on the latitude/longitude crosses on the Meteosat images. It is also more evident on the highest displayed resolution of your system as the filter in this case has the least time to settle and recover from the level change.

Converting the Signal

After the video information has been extracted from the carrier, it can be presented to the display device. In the case of a photographic facsimile machine, this signal will be used to drive the light source. However, the vast majority of users have a framestore or computer and therefore, the video signal must be digitised by presenting it to an A to D convertor.

The amplitude of the video signal needs to be adjustable so that the full span of the A to D convertor can be used. Also, the DC level needs to be adjustable to set the black level. I use a 16 LED bargraph display driven by the output of the A to D convertor to give visual indication of the video level. This allows me to use the full dynamic range of the convertor. A computer based systems may be able to adjust these levels automatically.

The sampling rate of the A to D convertor can be any frequency you wish and is determined purely by the required resolution of the displayed image. However, if the 2.4kHz carrier has not been suppressed adequately, the image will have banding or stripes caused by beating between the sampling frequency and the carrier. There is a special case where the sampling frequency is locked in phase with the carrier by means of a phase lock loop (PLL). The operation of a PLL causes its square wave output to be 90 degrees out of phase with the carrier which means that the transition of this output coincides with the peak of the carrier and the A to D conversion can be made at this point. Successive conversions will recover the envelope of the modulating video signal and, in theory, the low pass filter before the A to D is not required. My own set-up had no low pass filter initially and while the images from the polar orbiters were perfectly good, the Meteosat images had a furry feel to them, like looking at a grainy photograph. The addition of the low pass filter, while having no noticeable effect on the APT images, cleaned up the Meteosat images considerably.

Displaying the Image

With a continuous stream of A to D samples coming in, the next step is to organise these into a recognisable image with the correct aspect ratio. The signals from the NOAA, Meteosat and Soviet satellites all have the image formatted in a slightly different way although the method of transmitting it is the same. In all cases, the image is transmitted line by line.

With polar orbiter satellites looking in the direction of travel, the line scan goes from right to left. So, if the satellite is travelling south to north, the scan starts in the east and moves towards the west. With Meteosat, the image always scans from south to north and, like the polar satellites, from east to west.

So, how are successive lines displayed to give an image with the correct aspect ratio? First, the time taken to receive a complete line needs to be known so that the computer/framestore knows when to start displaying a new line on the screen. For polar satellites, the time is 0.5 seconds (although some Soviet satellites such as Okean use 0.25 seconds) and for

Meteosat, it is 0.25 seconds. This time could be derived from an internal clock in the computer. While this method would work with live signals, it would be unreliable with signals recorded on normal audio tape because of inevitable small variations in the tape speed. Therefore, the usual method is to use the 2.4kHz sub-carrier itself as a time source and divide this frequency down to provide the necessary timings, eliminating the problems caused by the speed variation. This method is fine if the sub- carrier frequency can be guaranteed. Unfortunately, the vast majority of Soviet satellites have unpredictable sub-carrier frequencies or sub-carriers that disappear completely in black areas of the image so the above method does not work. The usual solution is to use a stereo recorder and record a known frequency (usually 2.4kHz) on the spare channel which can then be used as the time source.

Next, the computer/framestore needs to know when the satellite has started to transmit a new line otherwise the end of one and the start of another will probably appear in the middle of the screen. This is achieved by the satellite's transmitting a short burst of a predefined frequency at the start of a line. This is the sync(hronisation) tone. The NOAA satellites transmit two sync tone bursts with one at 832Hz and the other at 1040Hz (the reason for two is described later). The Soviet satellites transmit a sync tone of approximately 300Hz but this is subject to variation. The Meteosat sync tone is 840Hz.

Assuming that the computer/framestore has placed one complete line on the viewing screen, it needs to know the vertical spacing to the next line so that the complete image will have the correct aspect ratio, that is, the land masses are the correct shape and not distorted. This information is provided by the Index of Co-operation (IOC) of the image. The IOC is derived from rotating drum facsimile machines and is the product of the drum diameter and line density where both have the same unit of measurement. For example, if the drum diameter were 152mm and there were 3.79 lines per mm, the IOC is 576. The same calculation works for a screen if you assume that the width of the screen is the same as the circumference of the drum, i.e. diameter x 3.142.

NOAA satellites and Soviet satellites transmitting 4 lines/second have an IOC of 576; Soviet satellites transmitting 2 lines/second and Meteosat have an IOC of 267. To see how the IOC is used, imagine that you have a screen with a width of 300mm and a complete line from a NOAA satellite fits this width exactly. The line density is IOC/diameter = 576/(300/3.142) = 6 lines/mm. Now, if the screen has a 4:3 aspect ratio, the depth will be

225mm. Therefore, the screen should display 225 x 6 = 1350 lines. If your screen is not capable of displaying this many lines, a solution is to display 1 line in 2 or 1 line in 3 or whatever until the calculated number of lines is close to the capability of your screen. Alternatively, displaying only part of a line alters the calculated number of lines. For example, displaying only half a line horizontally would halve the calculated number of lines to 675.

Interpreting the Image

Once an image has been built up on the screen, what can be made of this? I shall split this section into three and deal with NOAA polar orbiters, Soviet polar orbiters and Meteosat.

NOAA

The satellite contains a rotating mirror which scans a section of the earth directly beneath it at a rate of 6 lines/second. The scan angle is limited to 55 degrees from a point directly below the satellite corresponding to a total ground scan width of approximately 2800 km. The light from the rotating mirror is then directed towards a bank of sensors, each sensor being responsive to a different light wavelength. There may be four or five sensors, depending on the version of instrument fitted to the spacecraft. The ground resolution is 1.1km at a point directly below the satellite. However, at the extremities of the scan, the resolution degrades for geometrical reasons to 4km in the plane of the scan.

The data from each sensor is assigned a channel and is transmitted back to earth in digital form for primary users. However, most people are unable to receive these transmissions because of the complexity of equipment needed. Therefore, selected data is converted into analogue form and is transmitted in APT format (it is not possible to transmit all the data in APT format because of bandwidth limitations).

In the APT format, two selected channels are transmitted alternately with a constant ground resolution of 4km at a rate of 2 lines/second. The original higher resolution image has geometrical distortion caused by the scanning process, but a clever on-board computer removes this distortion before it is transmitted in APT format. If you see an uncorrected original digital image, there is quite severe distortion at the edges of the image. If an entire APT line is displayed on the screen, the two channels are seen side by side, each occupying half of a line.

Channels 1 and 2 work with radiation from the sun reflected by the earth, as is the case in normal daylight vision. Channel 1 covers the yellow-green

portion of the visible spectrum and channel 2 covers the red to near infra-red part. In the near infra-red, water allows light to travel through it easily with little reflection from the water/air surface. This is why infra-red images can penetrate fog and haze. For this reason, an area covered by water appears very dark in a channel 2 image and this feature gives good delineation between land and water.

Channels 3, 4 and 5 work with "black-body" radiation which is radiation given off by an object as a function of its temperature. Therefore, this radiation is always present, even at night. The images produced by these channels bear a direct relationship to the temperature of the earth underneath. By convention, the lightest parts of the image represent low temperatures and darker parts represent high temperatures.

The manner in which data from the 5 channels can be used selectively to interpret clouds, ice, vegetation, sea temperature and other features is beyond the scope of this article. However, a book that I found very useful in interpreting cloud patterns is given in [6].

As mentioned earlier, any two channels can be transmitted in the APT format. Normally, During daylight hours, channels 2 and 4 are transmitted with channel 2 being replaced by channel 3 when the satellite moves over night-time areas. However, there are occasions when this selection may vary. For example, when a NOAA satellite is launched, there is a delay of about 15 days before channels 3 to 5 become operational. During this time, the APT transmissions may well carry channels 1 and 2.

The image portion of each channel on a video line is preceded by a white or black space with a contrasting line which occurs every minute as a time marker. After the image portion, the telemetry frame is transmitted. If a full image is viewed, these appear as rectangles with varying levels of brightness adjacent to the right-hand side of the image (assuming that the image has not been inverted). Each rectangle is 8 lines deep. A complete telemetry frame consists of 16 rectangles, after which the pattern is repeated. There is no distinct start and stop indicator for the frame. They must be determined by examination when the format of the frame is known.

Rectangles 1 to 8 inclusive consist of a almost linear grey scale calibration with rectangle 1 being darkest and rectangle 8 being lightest. Rectangle 9 represents zero modulation and the blackest possible part of a image. Rectangles 10 to 15 inclusive display grey levels which correspond to calibration levels in the spacecraft. Rectangle 16 is the most useful to the

amateur observer as this shows the channel number of the associated image. To locate this, first find the 8 rectangles representing the grey scale calibration. Rectangle 16 is then the one before these. Match the grey level of rectangle 16 to a rectangle in the grey scale. The number of the matching grey scale rectangle equals the channel number.

Soviet

Soviet satellites transmit a single channel of image data which can be visible or infra-red and the ground resolution can often be better than those of the NOAA satellites.

The visible channel parameters are designed to display ice and snow very clearly at the expense of normal land detail as one of the prime requirements of the satellites is to assist shipping in Arctic waters. These satellites can give superb detail of snow covered land and cloud but leave ordinary land almost impossible to see unless the image is processed to stretch the contrast at the black end.

Meteor 3-3 and successive satellites in this series may transmit high resolution infra-red images. The grey scale is in the opposite sense to that of NOAA in that the coldest temperatures are represented by black and the warmest by white. To make the image conform to the more familiar format, the grey scale needs to be inverted or complemented.

Precise technical details for the Soviet satellites are hard to find and they can vary considerably from one family to another so it is best to keep reading the RIG journal to keep up to date.

Meteosat

Meteosat transmits three basic types of image, visible, infra-red and water vapour. These can be identified by the letters VIS, IR or WV in the header of the image. The raw image data is transmitted in high resolution to the ground station where it is processed and retransmitted to the satellite with land boundaries added in WEFAX format.

The image begins with a start tone of 300Hz for 3 seconds followed by a phasing signal for 5 seconds which can be used by receiving equipment to establish the border of the incoming image. A digital header lasting for 1 second is then transmitted. This contains the same information as displayed on the visible header but in ASCII format [7]. The image follows lasting for 200 seconds and each line has a resolution of 800 picture points. Finally, a stop tone of 450Hz is transmitted for 5 seconds.

Manipulating the Image

The image on the computer screen is formed from an array of digital intensity values called pixels (picture elements). These values can be changed by a mathematical algorithm to enhance the image to allow features to be seen more clearly [8,9,10].

If an algorithm changes the value of a pixel and the new value is based only on that pixel value and not adjacent ones, it can be called a point process. An example of these is logarithmic transform which is particularly useful where the image values tend to be bunched towards black or white. This is typical for winter visible and infra-red images respectively. Applying the transform to the visible case, the pixel values at the black end are spread apart at the expense of those at the white end. Although some cloud detail may be lost, the land shows up much more clearly.

The other major use of the point process is the contrast stretch. This works by analyzing the complete image and counting the number of times a pixel intensity occurs in the image area. If the contrast of the image is low, then intensity values with the highest number of occurrences will be bunched together. Selected intensity values on each side of the peak of occurrences can then be redefined as peak white and black respectively and values of the intermediate intensities are multiplied by a constant scaling factor to increase the contrast. Pixel values outside the selected range are discarded. This is the basis of the linear contrast stretch which works well for any type of image. A variation on this is the histogram contrast stretch where the intensity values are altered according to the number of times they occur in the original image. In this case, the greater the occurrence of any particular intensity value, the larger the number of intensity levels between this and the previously adjacent intensity level. I know that this sounds complicated but the algorithm is very easy to implement. This method is best used where the whole image has a very low contrast range or the results can be a bit weird. Note that the image area only should be analyzed as the inclusion of sync bars or telemetry would upset the result.

An algorithm which changes the value of a pixel based on that pixel's value AND the values of neighbouring pixels can be called an area process. An example of this involves selecting a pixel and its immediate neighbours, multiplying them all by predetermined scaling factors and replacing the original pixel with the sum of the results. Mathematically, this is known as convolution of the image. By appropriate choice of the scaling factors, the image can be subjected to low pass filtering which will remove fine detail and high pass filtering which will accentuate edges and fine detail (but also

noise). Other effects such as edge enhancement in a particular direction are possible. Another area process is the median filter which is used to remove noise spots. The intensity values of a pixel and its immediate neighbours are arranged in ascending order in a table. The original pixel is then replaced by the value at the centre of the table.

References...

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2. T. Bittan. *"Antennas for reception of orbiting weather satellites in the 137MHz band."* VHF Communications 4/81 pp 214-218.
3. P. Hayes. *"Pager phenomenon and other interference problems."* RIG Newsletter 20.
4. G. R. Jessop. *VHF/UHF Manual 4th Ed. RSGB. Page 8.45*
5. J. Grimm. *"Loop yagi antenna design for 13cm"*. VHF Communications 2/85 pp 72-78. Contains useful info on stacking.
6. R. R. Fotheringham. *"The Earth's atmosphere viewed from Space"*. University of Dundee.
7. *Meteosat Dissemination News 1/90.* Information Division, Eumetsat, Am Elfengrund 45, D-6100 Darmstadt-Eberstadt, Germany.
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10. G. Baxes. *"Digital Image Processing - A primer"*. Prentice-Hall.

NEW RIG PRICES...

Those of you with sharp eyes will notice that the prices in the RIG Shop Corner have been reviewed and set out differently. This is to allow overseas members to purchase at VAT-less prices. Many prices are unchanged and reflect the effect of VAT registration. Some have been increased, for example, the Newsletter prices, to accommodate the cost of postage which was previously under-costed or non existent. An extreme example was sending a years Newsletters in one sleeve to a far-away place, costing £3.50 postage, when we only charged £4.00 for them. These prices now reflect a much closer cost element on these items. There are 3 main categories. Rally price - over the counter - no postage. U K price - includes postage where appropriate. Overseas price - usually this is for light-weight items and does not vary very much. Newsletters are much heavier and we have differentiated them into 2 zones - European and Outside Europe. Receipts are available upon request. This should result in a much more realistic costing on all items.

WEFAX CARD FOR SATFAX SOFTWARE

Peter Williamson

This card was designed to provide an interface from an APT receiver to the PC bus to be used in conjunction with Michael Delahunty's SATFAX software. It can be used with other software which addresses H300 such as Elmer Schwittek's MF5. It is constructed on a half size IBM card as shown in fig. 1 (picture in centrefold) and is double sided. Originally a copy of the circuit in Ref. 1 was built but gave a poor performance in 3 areas:-

(1) AGC was found to be detrimental to picture quality.
(2) Video quality was poor ie poor resolution of fine detail.
(3) The ADC would sometimes latch up on switch on.

Item (1) was cured by deletion!.
Item (2) was found by software circuit simulation to be due to the video low pass filter cutting off at 450 Hz!. A cutoff of around 1600 Hz is desirable for full picture detail.
Item (3) No reset circuit on ADC.

A new video filter was designed with a phase response between a phase linear type and a butterworth response as a compromise to the desired transient response. (ref 2). A simple reset circuit was designed using a minimum of parts and has not given any trouble in 30+ pcbs constructed to date.

Circuit Description

Input from J1 is processed by U1C which acts as a 500 Hz high pass filter to reduce the effects of 50 Hz and 100Hz hum pickup from the receiver, power supplies etc.

Following the gain (Set peak white) pot. RV1, U1A and U1B form a precision full wave detector which doubles the sub-carrier to 4800 Hz and detects the video signal. U2C and U2D provide an active low pass filter to remove the doubled sub carrier component whilst providing sufficient bandwidth for full picture resolution. U2A buffers the filter to the ADC input. U3 is an ADC used to convert the analogue video signal to the 8 bit values required for computer processing, and is commanded to read by a low pulse on pin 2. Full scale is 2.0 V set by R18. No output buffering is used or needed as the chip is internally buffered. Q1 provides a power on reset by virtue of C12 R17 charging up and causing Q1's collector to pulse low at switch on. U4 and U5 provide logic decoding of H300 from the pc address buss and causes pin 2 of U3 to pulse low at the pixel sample rate.

Construction

Unfortunately a double sided PCB is necessary although the adventurous could possibly wire wrap the circuit onto a prototyping card, which usually contain the necessary bus decoding. PCB component and solder side plots are shown in FIG 2 and 3 , with component overlay in fig 4. Pay particular attention to the through connections as a through hole plated PCB was not used. Perhaps if there is enough interest RIG could produce PCB'S?. Use only first quality components, preferably 2% metal film resistors and polyester and tantalum capacitors.

Adjustment

This is the easy part!. Connect the RX audio output to J1 and with a satellite signal input, using the SATFAX "TEST" menu option 1 (REF 3) "Display ADC input values" advance RV1 until an occasional maximum reading of "255" occurs. If the unit fails to operate, an oscilloscope is essential to trace through each stage until an abnormal reading occurs. As a guide, at U1 pin 7 should be a clean Full wave +ve rectified sine wave and at U1 pin 1 2.0 V dc at peak white with near to 0 V at no input. Pin 2 of the ADC should show a very short negative pulse at the pixel sample rate if the decoding logic is working and the software is set to be scanning a picture.

If there is sufficient interest in these cards I could also write up a matching card for HF (FM) fax which provides stunning news photos in 64 levels of grey. If interested drop me a line... *Peter Williamson VK4AWP, 6 Cuthbert St., Albany Creek 4035, Australia.*

Please Note... This article is presented as a service to home constructors and is not a FREEBIE to commercial enterprises - with the exception of RIG of course.!

References...

(1) QEX Sept. 88 pg. 3
(2) Active filter cookbook (Lancaster)
(3) SATFAX V5.0 documentation pg. 22.

Acknowledgements...

(1) David Gulley for the photographs.
(2) Ian Macminn for PCB plotting and advice on CAD.
(3) Michael Delahunty for his constant updating of his excellent software.

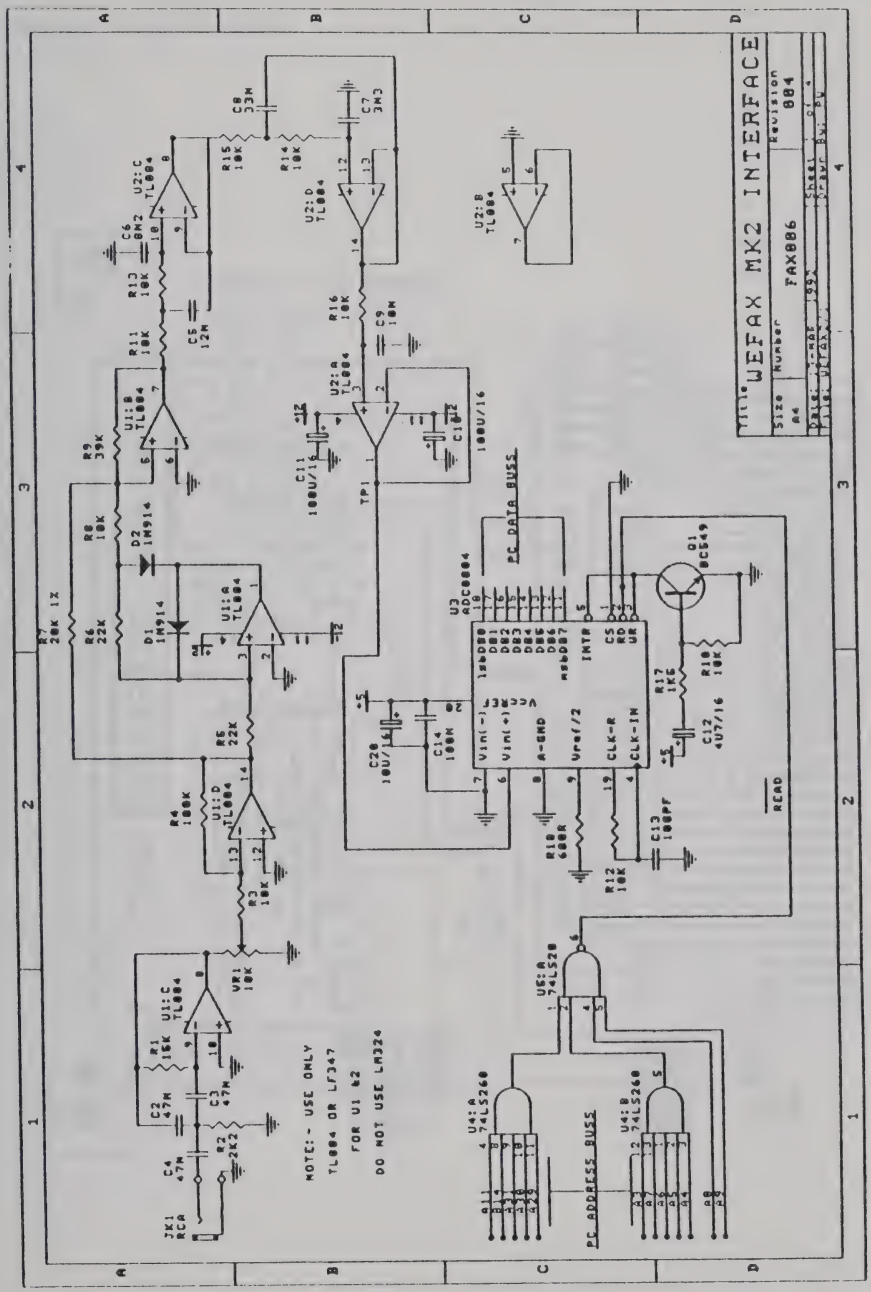

WEFAX MK2 INTERFACE
FAX086
004
NOTE:- USE ONLY
TL084 OR LF347
FOR U1 &2
DO NOT USE LM324
PC DATA BUSS
PC ADDRESS BUSS
READ

FIGURE 2 - COMPONENT SIDE

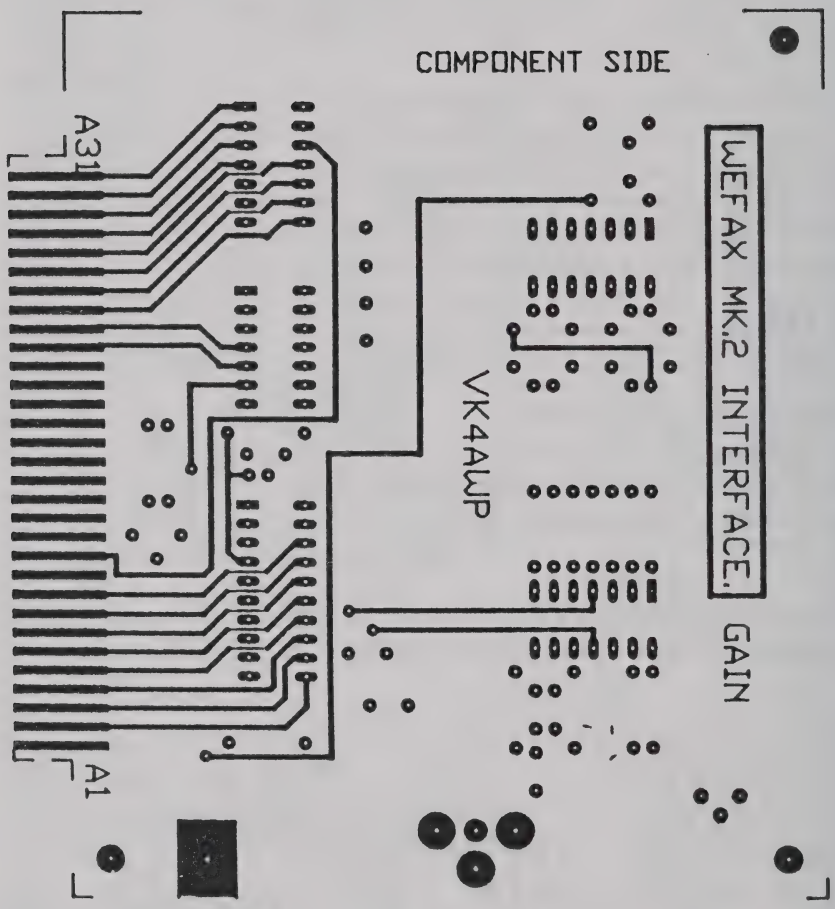


FIGURE 3 - SOLDER SIDE

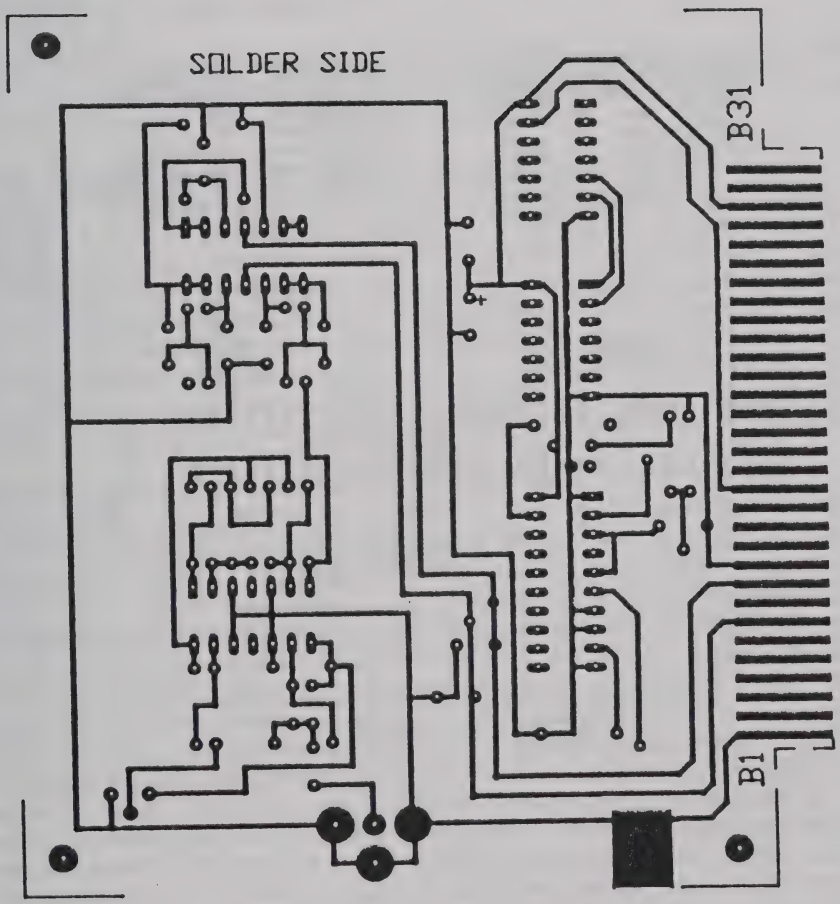
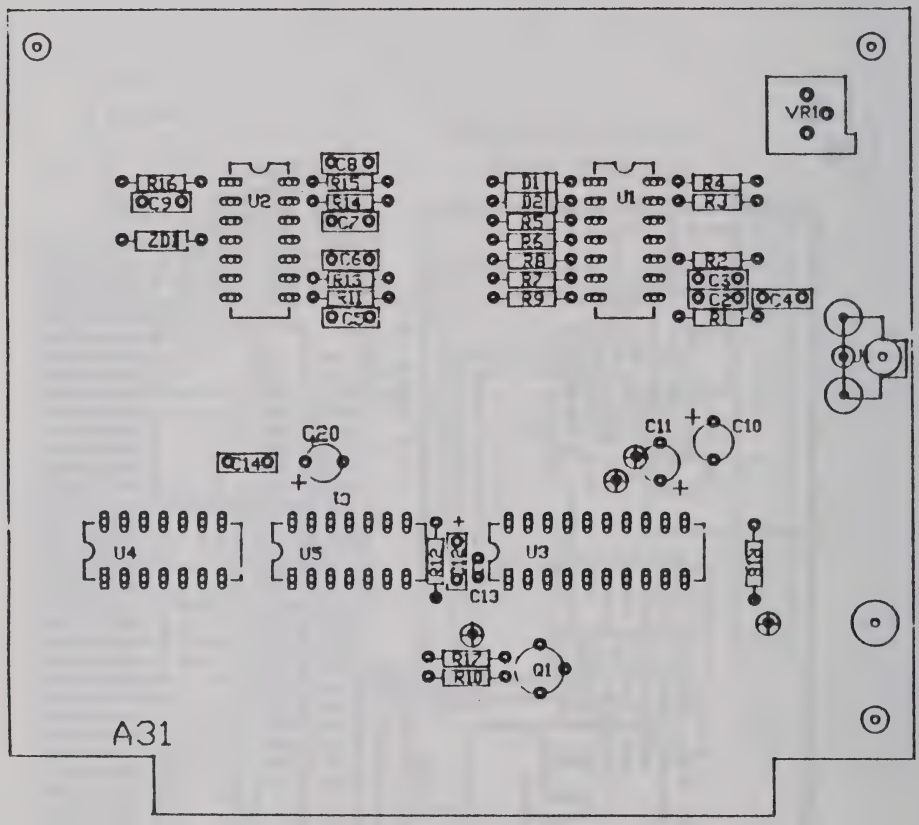


FIGURE 4 - COMPONENT LAYOUT



NOTE ⊕ = PIN THROUGH

A REVIEW OF THE TIMESTEP HRPT BOARD AND SOFTWARE FOR THE IBM PC

Peter Hayes

So, I finally gave in to the mounting pressure to invest in a PC as an alternative to the trusty frame store for HRPT. In truth, the wife wanted a new kitchen, so I said, yes, you can have a new kitchen if I can get a computer. The deal was agreed, and the PC arrived a few days later. As to which cost more, the computer or the kitchen, well, that's for me to know and for you to wonder about!!!

So, with the new toy safely installed, I sent off to Newmarket for the NOAA HRPT board and software. I also sent to Henry for PCSAT-3, which arrived virtually by return of post, well done Henry.

While waiting for the HRPT kit to arrive, I set about PCSAT-3. The board slotted in no bother, and I eventually got to grips with batch files, etc, found out how to switch the mouse off - not as easy as you might think, especially for someone new to the PC - got everything working and enjoyed my first attempts at computer imaging. It was a good introduction to the various image processing facilities such as SATSHOW as the HRPT program has similar routines, and the Animation facility was an education in how weather patterns build up, especially for someone previously used to just one image in a frame store. However, PCSAT-3 has been reviewed before in RIG, and has been superseded by PROSAT-2, so I'll move on to HRPT.....

For the benefit of those not yet familiar with HRPT, I'll give a quick run-down on the advantages of HRPT. The NOAA satellites carry a 5 channel radiometer, two channels in the visible or near visible range, and three in the infra-red range. One visible channel and one IR channel make up the APT signal, processed to a resolution of 4 KM, and sent on VHF, although at night another IR channel replaces the visible channel. Meanwhile the five channels are sent in digital form at the full 1.1 KM resolution on S-band (1.7 GHz). The over-riding advantage of sending the image data in digital form is the complete absence of noise and interference so long as the digits can be correctly identified at the receiver, and once you've got sufficient signal strength this is much easier to do than maintaining a good signal to noise ratio for APT. There are also no level problems to worry about; indeed, your receiver will give you a TTL data output and provided the computer gets the 1's and 0's right your pictures will come out right. The consequence of this is images of stunning quality; the spacial resolution is four times better than APT, 16 times better in area terms, and coupled with the total absence of noise makes the pictures very clean and pin-sharp, and well worth the effort. Another significant advantage is that the calibration set up in the satellite is preserved all the way to the computer, and you can perform various image processing techniques not possible on APT where you are limited to two channels. The only problem is that even

the best APT is so poor by comparison that you will never want to return to it!

To acquire sufficient signal for error free reception you will need a dish, together with a good head amp and feed. You will also need to steer the dish, and this is where you will have to reach a compromise between a large dish (the bigger the better for signal strength) and the ability of your tracking system to follow the satellite (the smaller the dish the wider the beam width and hence the easier it is to track the satellite). The compromise usually works out at about 1.2 M, given a decent head amp. Tracking the satellite is a doddle on low elevation passes below about 50 degrees, but near overhead passes can be extremely difficult, rather like a ship's gunner trying to shoot down enemy aircraft flying overhead. A small dish with its wider beam width will be decidedly better here. The problem is aggravated by the polarisation shifts evident on high angle passes where a left hand circular feed (reversed to right hand by reflection from the surface of the dish) is a decided advantage.

To track the dish use a substantial azimuth/elevation rotator, bearing in mind wind loading and other factors. A tip here is to park the dish pointing straight up when not in use. This will minimise wind loading, but make sure there is a drainage hole in the centre of the dish. If there is no hole, drill one about 1/4 to 1/2 inch diameter; it will have no effect whatsoever on the dish's performance, but will stop it acting as a water butt!! Manual operation of the rotators is generally recommended as the cumulative errors associated with automatic tracking together with errors in your Keplers may mean less than optimum signal. Ideally, your receiver will have some form of signal strength meter, try and keep the signal at its best with slight adjustments to both azimuth and elevation every 15 seconds or so. Like a lot of other things, practice soon makes perfect, or certainly good enough. This is where digital reception scores over any APT system, tracking errors will have no effect whatsoever, provided the signal is good enough for the digital circuitry to do its work properly.

The satellite transmits the five channels of digital data on S-band which can accommodate the required 3 MHz or so of bandwidth. There are dedicated receivers available, or you can use a standard Meteosat down converter feeding a suitable receiver designed to cope with the bandwidth and bi-phase transmission mode. I use the Martelec d/c for both Meteosat Primary and HRPT and it does the job adequately, coupled with a RIG style pre-amp at the feed. Whatever receiver you choose to use would normally be expected to give you a TTL (5v) bi-phase output. Bi-phase is the most robust method of transmitting the signal, and has the advantage that the clock needed to separate out the data is inherent in the signal. However, to make use of the signal, it has to be converted to a proper data stream (NRZ plus clock). This is usually done in hardware irrespective of whether you are using a frame store or a computer, indeed the entire display process can be

done in hardware, using an adapted frame store. You are better to use a computer, though, as you can recall the data at a later date for further analysis as well as performing all sorts of image processing effects impossible with a frame store.

As an indication of what you can expect from the various channels, the montage illustration shows one pass over Northern Italy in all 5 channels, after being "equalised" to improve the image contrast. *(It was not possible to reproduce the image in RIG due to loss of detail in the printing process, but those wishing to see the results can send for a copy of Disk 15 from the GIF Library, Mike)* To orientate yourself, the Mediterranean is at the lower half of the images with the tip of Corsica at the centre bottom, and with the snow covered Alps curving up from the Riviera coastline. The images show that channel 2 turns out to be the best for visible light, although channel 1 improves in the summer. The channel 3 image is particularly interesting. Notice the line of towns running from the Turin and Milan area heading towards the Adriatic coast, including Parma, Reggio, Modena and Bologna. Also visible, if the magazine reproduction is up to it, is a hint of the road and railway line as well, probably the result of a chain of small towns and villages merging into one line.

The sixth image is a subtraction of channel 2 from channel 1. This should give a vegetation index as green foliage radiates strongly in the near IR. The subtraction was done on the original, unequalised data, as any processing would destroy the relationship carefully set in the satellite. The result of the subtraction was subsequently processed to increase the contrast. Note how the menu bar at the top of the picture has disappeared as a result of the subtraction process. Ideally, for a vegetation index the channels should be divided, not subtracted, but I don't have any software to do this. However, you can still get interesting results, for example, notice how the sea round the Italian Riviera extending to Corsica displays variations not apparent from either of the original images. Interpretation of processed images is a complex business, and the explanation for the effect round Corsica may have several origins, for example, it may be showing sea currents, or perhaps large areas of plankton, or maybe it's an atmospheric effect; considerable skill is needed to interpret these images correctly. I should add that the montaging and image subtraction were done with the Public Domain program "PICLAB" which is not supplied with the HRPT program, but is available from any Shareware dealer for the cost of copying. It does though show you what is possible once you have acquired the data.

The Timestep HRPT system requires that the PC be '286 based (or better), and have a hard disc with, in practice, at least 60 MB capacity, and with an access time better than 17 mS if you wish to store more than one channel. Fortunately, most modern high capacity hard discs have relatively good access times. The Timestep HRPT board plugs into any available 16 bit expansion slot in the computer, and the operation is very straightforward,

with no tweaks to worry about. The board takes in a TTL signal from the receiver on a 9-pin D-type, and there is a "lock" signal output available on the same D-type. This can be used to light a LED to indicate that the system is working satisfactorily. The board itself is of perfectly satisfactory construction quality, containing mainly standard TTL chips, but using a "PAL" to generate the parallel data. Along with the board and software you also get a "dongle" which plugs into the parallel printer port. It doesn't interfere with the printer, but without it the program does nothing except to tell you the dongle's missing, and then returns to DOS. There is no restriction on how many computers you install the program on, but the supplied dongle must be present to allow the program to run.

The software installation was painless. Typing "INSTALL C:" was all that was needed and off we went. It even works with the mouse on, needs to really since the whole program is drop down menus and mouse orientated. In practice you don't need a mouse except for the temperature and lat/long readouts, but having one speeds up operation considerably. My HRPT receiver I'd used with the framestore worked fine with the new board and I had virtually instant success. A quick test with my satellite simulator to check the system out, then the first NOAA pass gave me a 45 Megabyte file to play with. You can select the channel you wish to display during the signal acquisition process. The image as received, or when loaded in from disc, is very stretched horizontally, like a hall of mirrors effect, as the entire pass is made to fit onto one screen, but when you zoom in the aspect ratio, or index of co-operation if you prefer, is corrected. Having all the pass on the screen at one go makes it much easier to locate where to zoom to, and with the "point" zoom facility you can instantly switch to any area at full zoom.

You have to choose carefully the screen resolution you wish to use. There are traps here for the unwary! You might imagine, as I did, that 1024 x 768 would be what to go for, and it does give the best results, but it requires more thought than that. You can pick any display resolution you like for receiving or downloading from disc, but the fun and games begin as soon as you attempt to archive parts of the image. You can get some strange effects if you try to process pictures saved in the "wrong" display format, effects similar to loss of line hold on your TV, or pictures split in two, or four, etc, but after some experience you soon learn the rules of the game, and a display resolution of 800 x 600, is much more reliable for archiving. It also makes the menu and dialogue boxes far easier to read as well!

With a fast (16mS or better) hard disc you can choose how many of the 5 imaging channels you want to store, otherwise you're limited to only one channel. A full pass with all 5 channels and calibration data needs well over 50 Megabytes of disc space, possibly approaching 100 MB if you have a good site. You can choose not to save the calibration data and this will cut down a bit on disc space, but you won't subsequently be able to read

temperatures for example. At night you don't want Channels 1 and 2, the visible light channels, so this will reduce storage requirements somewhat, and as channels 4 and 5 are similar you can economise further if your disc is getting full. A recommended daytime minimum would probably be channels 2 and 4, this giving good coverage which doesn't gobble too much disc space. You have to make your channel choice with care as you are stuck with the selection you made when receiving the satellite; you can't subsequently "re-save" the raw data minus unwanted channels. This is a pity as otherwise it would have allowed you to receive all channels and subsequently throw away those of no interest on that particular pass, thereby reducing storage requirements. Believe me, you'll rapidly fill even the biggest of hard discs, but if you think you've got problems, spare a thought for the Landsat operators; a computer compatible tape (CCT) would be filled in 25 seconds with the data from that satellite! It's possible to save small sections of any one channel to files some 500 K or 750 K bytes in size, and this is ideal if you wish to archive interesting images, but you lose the calibration data, a major defect for serious users. Unfortunately, the section is too small to enclose, for example, the British Isles at full resolution and as it's not possible to save larger portions of a pass, the only way to archive is to fit a tape streamer system and thereby free disc space. This will also save the calibration data essential for any serious application. However, tape streamers are horribly slow, and the ideal would probably be to define the area to be archived with the mouse, together with the required channel(s), and re-save only this selected area together with its calibration data. Perhaps a future software update will include something on these lines.

All facilities, including the initial image acquisition routine, are incorporated within one program containing a series of drop-down menus. These include 3 zoom levels, gridding, and various facilities for image processing, as well as an "invert" function should you save the pass going the "wrong" way. You cam immediately switch to any part of a pass at full zoom using the "point" option; place the mouse cursor at the centre of the area you wish to zoom to, click, and up comes the selected area at full zoom. This can save a lot of hassle and is a splendid facility. Alternatively, you can go for the "box" option which allows you to select just what the next zoom level will give you. You can also roam around at various zoom levels with a "roaming zoom" facility similar to that included in PCSAT-3's SATSHOW. It could take quite a while going across an image on a slow machine, though, as all data is read in from the hard disc and unravelled by the processor, and the more channels you stored during the pass the slower these zooming processes are for this reason. Hard disc fragmentation, having the data file scattered around the disc and not saved in one place, whilst not affecting data acquisition, can also slow down panning or zooming while the drive hunts around the disc for the data. Disc defragmentation programs will clear up the problem, and it's a good idea to tidy up the disc before receiving images.

Maximum zoom level is claimed to get you down to pixel level, but you'll need a magnifying glass if you want to see them, and the program is crying out for at least one more zoom level, and preferably two. The only place you're likely to see them easily is right at the edge of the picture where they have been "stretched" (geometrically corrected) to overcome the "milk bottle effect" caused by the foreshortened view the satellite has at the edges. In any event, the need for additional zoom levels becomes very obvious when looking at fine detail, and it seems a pity that the program gets you tantalisingly close to detail without letting you see it at full resolution. It may be that on a 17" or 20" SVGA monitor all comes good, but few of us can afford the considerable extra cost of one of these monsters.

There is the facility to mark off and save to disk an area of the channel being displayed the size of a fully zoomed in screen and this can be further processed by a separate program, SAT1024, or SATSHOW if you've got PCSAT-3, and this allows you to zoom in further. One or two more zoom levels within the main program would have allowed you to get down to true pixel level with much less hassle, and with all the channels you originally downloaded immediately available. This need is reinforced when you consider that you cannot fit the entire British Isles into a section; you need about 1 MB per channel for this. As the name suggests, SAT1024 will accept sectors sized at 1024 x 768, and the alternative sector size, 800 x 600 is intended for the SATSHOW program included with PCSAT-3. However, none of these programs support the temperature readout or gridding facilities, and these facilities will be lost.

"Gridding" allows you to display lines of latitude and longitude, the accuracy depends on how accurate your keplers are as well as the setting of the computer's clock. Also, any breaks in the image caused perhaps by mis-tracking destroys its accuracy. If you start receiving images as soon as the satellite appears, you are almost certain to have at least one break early on as the signal strength builds up and this will upset the accuracy. Your keplers have to be updated regularly with accurate data otherwise the gridding can give you bizarre results. This, of course, is no fault of the program; you have to give it accurate information if you want accurate results. As a supplement to gridding, you can also have a lat/long readout of the mouse cursor position. This has obvious benefits when the bulk of the image is covered in cloud.

The image processing facility includes the excellent "equalise" function which gives particularly good results as there is no noise to spoil the picture, and the improvement it can make to dark winter visible light images is outstanding. The histogram equalisation works by redistributing pixels over the grey scale in proportion to their frequency of occurrence, for example, 75% of the pixels will be distributed over 75% of the grey scale whereas in the original picture they might have been bunched together over a narrow

range, perhaps as little as 10% in the case of some IR images. The effect of this is to greatly increase the contrast of many images at little or no cost in terms of noise. The only tradeoff would appear to be that small differences in greyscale are crushed out; as you can see from the montage of Italy, the slight differences brought out by the subtraction process must have been present in the original data, but were lost when the images were "equalised". The manual keeps suggesting you try "equalise" first, and for the vast majority of images the results justify this advice.

In addition to "equalise", there is a selection of palettes supplied with the program, or you can produce your own "palette" to enhance an image or to add false colour in exactly the same way as with PCSAT-3, and anyone familiar with the image processing facilities of PCSAT-3 will have no trouble moving to HRPT. It becomes evident, though, that the program stores only the "upper" 8 bits of the 10 bit data stream from the satellite as dark winter visible light images are noticeably more quantised than when using the "lower" 8 bits with the framestore. This seems a pity as the NOAA's have the highest radiometric resolution of any satellite in normal service, but limiting the data to 8 bits will have programming advantages as computers work in multiples of 8. It will also help to keep the length of the data file under control. In practice the quantising shows up mainly on dull winter pictures, and those near the terminator, and sometimes on the 3 IR channels when stretching images of low contrast, otherwise the effect will be minimal.

But the highlight, for me at least, of the entire program is a temperature readout facility. This works with channels 3, 4 and 5, the IR channels. Select "read temp", move the mouse to any location and the temperature is displayed on screen, with or without lat/long as you see fit. On a frosty night, for example, you can "measure" the temperature of a river or lake at, say, 3 deg C, while the riverbank is perhaps -5 deg C. The picture of northern Scotland shows a temperature readout in action. Look for the arrow pointing at Loch Ness, and in the top right hand corner is the temperature readout, 5.1 deg C. The surrounding hills were at -2 deg C. This was a Channel 3 image. Towns show up as "hotspots" just as with APT, but the temperature difference may only be a few degrees. Clouds show up as really cold, some at -50 deg C. Sea temperature can be measured too, and you can trace the passage of the Gulf Stream round our coasts, getting progressively cooler the further north you go. All fascinating stuff!!! The temperature data is read directly out of the hard disc, so it will maintain its accuracy even if you have "equalised" the image, or done some other processing on it. A colour based temperature display routine is available, which can bring out tiny temperature differences, so illustrating sea currents or highlighting rivers in false colour form. You can select the range of temperatures you wish to colourise from -100 C to +50 C with a minimum difference of 15 deg C, so you could for example concentrate on the seas round our shores, and the clouds at -50 deg C will appear as white,

and the hot land will appear as black with the range of interest picked out in false colour.

There are pitfalls though. You cannot guarantee 100% accuracy; it's not the same as dipping a thermometer into the sea. By throwing away the "lower" 2 bits out of the 10 bit data stream, the program will never give full satellite accuracy, but the error should be under 1%. A more serious source of error relates to how clear the atmosphere is above the target site, even a thin veil of cloud not immediately apparent will alter the readout, usually reducing it by a degree or so. The readout accuracy will also be impaired if the object you're measuring doesn't fully fill the pixel you've selected, A lake for example, will have to be about 3 km in diameter to guarantee that at least one pixel represents radiation from only the lake. The accuracy of satellite data was tested some years ago when NOAA set up Project LACIE, the Large Area Crop Inventory Experiment, mainly using Landsat data, but including data from aircraft as well as ground based readings for comparison. This proved that satellite data could be relied on provided its limitations were understood. For example, Project LACIE accurately predicted the final level of wheat production in the USSR in 1978 using data from Kansas wheat fields as a control.

The laser print dump routine HPDUMP was included with my version of the HRPT package and is the same one that is included with PCSAT-3 and PROSAT-2. This talked to my Deskjet 500 printer, but the results are disappointing as on most images it seems limited to about 4 grey levels. Contrasty images print best, and it makes a creditable attempt at printing out the Meteosat test card, producing 7 of the 8 steps on the upper step wedge at the bottom of the picture. You would therefore expect that you could process your image, making it more contrasty, and then print it. Unfortunately, with the original software this wasn't possible. You could save the "palette" you made to improve the picture, but there was no mechanism to let you print out the improved picture. Winter daytime visible light images are inherently in need of considerable contrast expansion as the light level is so low, far lower than most of us realise, and the "equalise" routine does such a good job that it seems sad that this improvement couldn't easily be passed on to a printer. In addition, most IR pictures have the same low dynamic range as their APT derivatives, and "equalise" sorts these out very well also. However, very recently, Timestep have released an improved HPDUMP routine, producing excellent printouts even on the Deskjet, and they have also modified the HRPT program to incorporate this routine, and it is now possible to process images and print them directly from within the program, with splendid results. Exactly what was lacking before, and is a good example of a company responding to customers' suggestions, and should satisfy the need for good quality hard copy.

The documentation supplied can best be described as adequate rather than brilliant, the poorest aspect for me is the description of how to colourise an

image. This is described using the supplied demo images, but it's not clear what's going on while you move steps up and down, etc, and it takes some time to get the brain round just what is happening. The coloured images supplied with the HRPT demo disc are superb, and the COL1 palette gives similar results, but it can take a lot of skill and patient practice, and sometimes pure luck, to get the best out of a picture.

Apart from the archiving problem and the need for additional zoom levels, the HRPT package is superb, Easy to install, easy to use with the drop-down "Windows 3" command style, seems to be bug free, and the results are really stunning.

One little niggle I have though is that there is no indication of the channel being displayed. Channels 1 and 2 can look similar, as can 4 and 5, and it would be helpful to have an indication of the channel being displayed, perhaps on the menu bar. I know you're supposed to remember what channel you're looking at, but it's easy to forget and there's no way to find out, especially if you've just downloaded it from disc, other than cycling through all the possibilities, as the channel selection dialogue box only tells you the channels available.

These few additions to the HRPT program would round it off nicely, perhaps they'll appear in the next revision, but nevertheless the package is absolutely superb with a good professional feel, and represents excellent value for money. For around £200 (RIG member's price) you will get results far ahead of anything any APT based system can possibly deliver. Don't forget, though, that in addition to the Timestep board you'll need a suitable receiver and antenna, plus the facility to track the satellite, even if it's only by the so called Armstrong method. However, I understand that the HRPT receiver, connecting cable, HRPT card and software are on "special offer" at £499.00 for a limited period to UK RIG members only, and this will solve the problem of the receiver, remembering that it incorporates its own downconverter as well as the phase locked receiver.

Those who like manipulating images will find endless scope for experimentation; buy a few books on remote sensing and digital image processing, and together with the HRPT system and some Shareware or PD image processing programs, you can learn a lot as well as adding a new dimension to your hobby.

One significant benefit of HRPT that became apparent to me after a while is the absence of fading as the satellite "rises". Once the satellite is line of sight to the dish there is little or no pick up of the ground reflection that would otherwise produce the cyclical fading characteristic of APT at the beginning of a pass. When the signal is strong enough to lock the receiver the image comes through unimpaired, unlike APT where North Africa and Spain can be unusable on occasions, certainly from this location.

Finally, thanks to John Dubois and Ed Murashie for the initial inspiration to develop computer based HRPT reception, and to Dave Cawley and Peter Arnold of Timestep for producing a remarkable package at an attractive price. I hope the product is the success it deserves to be!

FOR SALE...

Microwave modules Meteosat convertor and pre-amp, new £75.00 pair

Skyview PC HF FAX, RTTY, FEC, and Navtext program and interface, new £29.00

Colour RIX VGA Paint, only suitable for Paradise and ET3000 video cards, new £20.00

Phillips VGA small Laptop 286 PC, 40Mb hard drive, 3.5" floppy, 110/240V charger, space for internal half card, will run PROsat II (available separately at a low cost if required) £399.00

Oliveti Laptop PC, twin 3.5" floppies, will even run WordPerfect ! £99.00

Amiga A500 with Commodore Memory expansion and second drive £75.00 (USA spec machine 110V with auto-transformer)

Apple II GS with second drive £75.00, or £100 for two !

Apple IIe and disc drive £35.00

ITT Chaeta Telex machine with built in printer, screen and word processor £25.00 (buyer collects)

Locata/Racal Navtext receiver/printer £50.00

AOR FAX printer, 12 months old, A4 paper roll, audio in and paper out, for HF and LF FAX £50.00

Sony AN P1200 Meteosat convertor and dish, 2 months old, cost £2000.00 ! sell for £800.00 ??

Offers for anything or swap for Test Gear or anything interesting.
Dave Cawley 0440 820040

MK2 INTERFACE
GAIN
VK4AEP

BUFFER: Line Length=640 Line Count=800 Line Reps=2

PRINTER: Line Count=1600 White=255 b=16 a=5 c=16

NOAA 9 PERIOD 101.93 MINS FREQUENCY 137.62MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/07	08 18	18.09	01/08	08.25	18.15	01/09	08.30	18.21
02/07	08.05	17.15	02/08	08.12	18.02	02/09	08.17	18.08
03/07	07.52	17.43	03/08	07.59	17.49	03/09	08.04	17.55
04/07	07.39	17.30	04/08	07.46	17.37	04/09	07.51	17.42
05/07	07.26	18.59	05/08	07.33	19.05	05/09	07.38	19.11
06/07	07.13	18.46	06/08	07.20	18.52	06/09	07.25	18.58
07/07	07.01	18.33	07/08	07.07	18.40	07/09	07.12	18.45
08/07	08.30	18.20	08/08	08.36	18.27	08/09	08.41	18.32
09/07	08.17	18.07	09/08	08.23	18.14	09/09	08.28	18.19
10/07	08.04	17.54	10/08	08.10	18.01	10/09	08.15	18.06
11/07	07.51	17.42	11/08	07.57	17.48	11/09	08.02	17.52
12/07	07.38	17.29	12/08	07.44	17.35	12/09	07.49	17.39
13/07	07.25	18.58	13/08	07.31	19.04	13/09	07.36	19.08
14/07	07.12	18.45	14/08	07.18	18.51	14/09	07.23	18.55
15/07	08.41	18.32	15/08	08.47	18.38	15/09	08.52	18.42
16/07	08.28	18.19	16/08	08.34	18.25	16/09	08.39	18.29
17/07	08.15	18.06	17/08	08.21	18.12	17/09	08.26	18.16
18/07	08.02	17.53	18/08	08.08	17.59	18/09	08.12	18.03
19/07	07.49	17.40	19/08	07.55	17.46	19/09	07.59	17.50
20/07	07.36	19.09	20/08	07.42	19.15	20/09	07.46	19.19
21/07	07.23	18.56	21/08	07.29	19.02	21/09	07.33	19.06
22/07	07.10	18.43	22/08	07.16	18.49	22/09	07.20	18.53
23/07	08.39	18.30	23/08	08.45	18.36	23/09	08.49	18.40
24/07	08.26	18.17	24/08	08.32	18.23	24/09	08.36	18.27
25/07	08.13	18.04	25/08	08.19	18.10	25/09	08.23	18.14
26/07	08.00	17.51	26/08	08.06	17.57	26/09	08.10	18.01
27/07	07.47	17.38	27/08	07.53	17.44	27/09	07.57	17.48
28/07	07.34	19.07	28/08	07.40	19.13	28/09	07.44	19.17
29/07	07.22	18.54	29/08	07.27	19.00	29/09	07.31	19.04
30/07	07.09	18.41	30/08	07.14	18.47	30/09	07.18	18.51
31/07	08.38	18.28	31/08	08.43	18.34	----------		

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

NOAA 10 PERIOD 101.13 MINS FREQUENCY 137.50MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/07	07.11	16.57	01/08	06.29	17.56	01/09	07.27	17.13
02/07	06.47	18.14	02/08	07.46	17.32	02/09	07.02	18.30
03/07	08.04	17.50	03/08	07.21	17.08	03/09	06.38	18.05
04/07	07.40	17.26	04/08	06.57	18.25	04/09	07.55	17.41
05/07	07.15	17.02	05/08	06.33	18.00	05/09	07.31	17.17
06/07	06.51	18.18	06/08	07.50	17.36	06/09	07.06	18.34
07/07	06.27	17.54	07/08	07.26	17.12	07/09	06.42	18.09
08/07	07.44	17.30	08/08	07.01	18.29	08/09	07.59	17.45
09/07	07.20	17.06	09/08	06.37	18.05	09/09	07.35	17.21
10/07	06.56	18.23	10/08	07.54	17.40	10/09	07.10	16.57
11/07	06.31	17.59	11/08	07.30	17.16	11/09	06.46	18.13
12/07	07.48	17.34	12/08	07.06	18.33	12/09	06.22	17.49
13/07	07.24	17.10	13/08	06.41	18.09	13/09	07.39	17.25
14/07	07.00	18.27	14/08	07.58	17.45	14/09	07.15	17.01
15/07	06.36	18.03	15/08	07.34	17.20	15/09	06.50	18.18
16/07	07.53	17.39	16/08	07.10	16.56	16/09	06.26	17.53
17/07	07.28	17.15	17/08	06.46	18.13	17/09	07.43	17.29
18/07	07.04	18.32	18/08	06.21	17.49	18/09	07.19	17.05
19/07	06.40	18.07	19/08	07.38	17.24	19/09	06.54	18.22
20/07	07.57	17.43	20/08	07.14	17.00	20/09	06.30	17.57
21/07	07.33	17.19	21/08	06.50	18.17	21/09	07.47	17.33
22/07	07.09	18.36	22/08	06.26	17.53	22/09	07.23	17.09
23/07	06.44	18.12	23/08	07.42	17.29	23/09	06.58	18.26
24/07	08.01	17.47	24/08	07.18	17.04	24/09	06.34	18.01
25/07	07.37	17.23	25/08	06.54	18.21	25/09	07.51	17.37
26/07	07.13	16.59	26/08	06.30	17.57	26/09	07.27	17.13
27/07	06.49	18.16	27/08	07.47	17.33	27/09	07.02	18.30
28/07	06.24	17.52	28/08	07.22	17.09	28/09	06.38	18.05
29/07	07.41	17.28	29/08	06.58	18.25	29/09	07.55	17.41
30/07	07.17	17.03	30/08	06.34	18.01	30/09	07.31	17.17
31/07	06.53	18.20	31/08	07.51	17.37	----------		

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

NOAA 11 PERIOD 101.98 MINS FREQUENCY 137.62MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/07	03.06	14.39	01/08	03.34	13.25	01/09	04.01	13.52
02/07	02.54	14.27	02/08	03.22	14.55	02/09	03.49	13.40
03/07	04.24	14.15	03/08	03.10	14.43	03/09	03.37	13.28
04/07	04.11	14.02	04/08	02.58	14.31	04/09	03.24	14.57
05/07	03.59	13.50	05/08	04.27	14.18	05/09	03.12	14.45
06/07	03.47	13.38	06/08	04.15	14.06	06/09	03.00	14.33
07/07	03.35	13.26	07/08	04.03	13.54	07/09	04.29	14.20
08/07	03.22	13.13	08/08	03.50	13.42	08/09	04.17	14.08
09/07	03.10	14.43	09/08	03.38	13.29	09/09	04.05	13.56
10/07	02.58	14.31	10/08	03.26	13.17	10/09	03.52	13.44
11/07	04.28	14.19	11/08	03.14	14.47	11/09	03.40	13.31
12/07	04.15	14.07	12/08	03.01	14.34	12/09	03.28	15.01
13/07	04.03	13.54	13/08	04.31	14.22	13/09	03.15	14.49
14/07	03.51	13.42	14/08	04.19	14.10	14/09	03.03	14.36
15/07	03.39	13.30	15/08	04.02	13.58	15/09	04.33	14.24
16/07	03.26	13.18	16/08	03.54	13.45	16/09	04.20	14.12
17/07	03.14	14.47	17/08	03.42	13.33	17/09	04.08	13.59
18/07	03.02	14.35	18/08	03.30	13.21	18/09	03.56	13.47
19/07	02.50	14.23	19/08	03.17	14.50	19/09	03.43	13.35
20/07	04.19	14.11	20/08	03.05	14.38	20/09	03.31	13.22
21/07	04.07	13.58	21/08	02.53	14.26	21/09	03.19	14.52
22/07	03.55	13.46	22/08	04.22	14.13	22/09	03.06	14.39
23/07	03.43	13.34	23/08	04.10	14.01	23/09	04.36	14.27
24/07	03.30	13.22	24/08	03.58	13.49	24/09	04.24	14.15
25/07	03.18	14.51	25/08	03.45	13.37	25/09	04.11	14.02
26/07	03.06	14.39	26/08	03.33	13.24	26/09	03.59	13.50
27/07	02.54	14.27	27/08	03.21	14.54	27/09	03.47	13.38
28/07	04.23	14.15	28/08	03.09	14.42	28/09	03.34	13.25
29/07	04.11	14.12	29/08	02.56	14.29	29/09	03.22	14.55
30/07	03.59	13.50	30/08	04.26	14.17	30/09	03.10	14.43
31/07	03.47	03.38	31/08	04.14	14.05	----------		

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

NOAA 12 PERIOD 101.31 MINS FREQUENCY 137.50MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/07	07.49	19.18	01/08	08.28	18.15	01/09	07.24	18.52
02/07	07.28	18.56	02/08	08.06	17.54	02/09	08.44	18.31
03/07	08.47	18.35	03/08	07.45	19.13	03/09	08.22	18.09
04/07	08.26	18.13	04/08	07.23	18.52	04/09	08.00	17.47
05/07	08.04	17.51	05/08	08.43	18.30	05/09	07.38	19.07
06/07	07.42	19.11	06/08	08.21	18.08	06/09	07.17	18.45
07/07	07.21	18.49	07/08	07.59	17.47	07/09	08.36	18.24
08/07	08.41	18.28	08/08	07.38	19.06	08/09	08.15	18.02
09/07	08.19	18.06	09/08	07.16	18.45	09/09	07.53	17.40
10/07	07.57	17.45	10/08	08.36	18.23	10/09	07.31	19.00
11/07	07.36	19.04	11/08	08.14	18.01	11/09	07.09	18.38
12/07	07.14	18.43	12/08	07.52	19.21	12/09	08.29	18.16
13/07	08.34	18.21	13/08	07.31	18.59	13/09	08.07	17.55
14/07	08.12	17.59	14/08	07.09	18.38	14/09	07.46	19.14
15/07	07.51	19.19	15/08	08.29	18.16	15/09	07.24	18.52
16/07	07.29	18.57	16/08	08.07	17.54	16/09	08.43	18.31
17/07	08.49	18.36	17/08	07.45	19.14	17/09	08.22	18.09
18/07	08.27	18.14	18/08	07.24	18.52	18/09	08.00	17.47
19/07	08.05	17.53	19/08	08.43	18.30	19/09	07.38	19.07
20/07	07.44	19.12	20/08	08.22	18.09	20/09	07.17	18.45
21/07	07.22	18.51	21/08	08.00	17.47	21/09	08.36	18.23
22/07	08.42	18.29	22/08	07.38	19.07	22/09	08.14	18.02
23/07	08.20	18.07	23/08	07.17	18.45	23/09	07.53	17.40
24/07	07.59	17.46	24/08	08.36	18.23	24/09	07.31	18.59
25/07	07.37	19.05	25/08	08.14	18.02	25/09	07.09	18.38
26/07	07.15	18.44	26/08	07.53	17.40	26/09	08.29	18.16
27/07	08.35	18.22	27/08	07.31	19.00	27/09	08.07	17.54
28/07	08.13	18.00	28/08	07.09	18.38	28/09	07.45	19.14
29/07	07.52	19.20	29/08	08.29	18.16	29/09	07.24	18.52
30/07	07.30	18.59	30/08	08.07	17.55	30/09	08.43	18.30
31/07	07.08	08.37	31/08	07.46	19.14	----------		

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

Reps=3 Line Feeds=0 Margin=64 Text Size=2

COLOURING WXSAT PICTURES

Mike Goodall

We often get asked how we manage to colour GIF pictures for the Library, and convert them from the DAT and NOA files produced on PCSAT 3 and PROSAT II. Colouring in the GIF format is not easy. Image Process can do this, but you have to individually change the colour values of each of the 256 grey levels to achieve it. The best way if you are using the Timestep packages is to use the Set Colour options to make a palette, available though the on-screen menus.

There are three basic types of palettes you can produce for your image. The first and easiest is a black and white one, designed to enhance your original file.

The second is a full colour palette, designed to convert the original image into an acceptable colour one for demonstration purposes. The purists among you will throw up their hands in horror, but I bet there are dozens of members who were impressed when first seeing colour images, and no doubt were swayed into joining our group.

The third is a false colour palette, which has only one function; to show more detail of changes of grey levels, especially subtle ones, for the purpose of measuring and easily viewing temperature variations, etc. (as on NOAA IR images). The colours have no other relevance.

Getting Started

The first thing to do is save a Meteosat picture (a C2D is an excellent one to start with) and then load one of the palettes supplied with the package. You will see several separating bars on the grey level column, which separate the different colour or grey level bands.

To start with click on "Select" and move the bar up to near the top of the grey level column. Then click on "Drag" and pull down the bar with the down arrow or with the cursor down key. The picture will lighten, and show far more detail at the top, where there is a lack of illumination, except in high Summer. If you drag it too far down, you will simply burn out all the details in the clouds, and turn them all white. Next press "Select" and position the bar about one quarter of the way up. Press "Change" and then "Select" again. This will generate a new bar at the quarter of the way up position. Then try dragging this bar up and down. It will change the black

to grey levels, and make quite a difference to your picture. Experiment on B&W images for some time before attempting colour, and make sure you understand what is happening.

Now to Colour

The three colour sections with their up and down arrows will alter the colour of the point at which a bar is selected, and will give you the sum of the three colours (displayed in the box below the main column). Experiment by generating several bars up the column and selecting and colouring each one different in turn. You will see that when you colour a bar only the areas adjacent to the bar will actually contain this colour, and it will merge into the next bar colour above and below. To keep the colour constant over a large area of the column, you will need to generate another bar right next to the original. If you do this with the next original bar above, and then set the colours of both bars, either side of the block you require to be of a constant colour, to the same red, blue and green values, the block will be of a constant hue. A word of warning when dragging bars... If you drag a bar over the position of another bar it will delete the bar traversed and merge into the next area.

When colouring pictures for demo purposes, it is unlikely that you will need any area of a constant hue. The normal palettes we produce for NOAA visual images start at the bottom with a deep blue, next a mid brown, then a mid green, and finally a white, at the top. Most of the colour bands will lie in the bottom third or less of the column area. The bugbear with colouring Visual and IR images to make them look like colour views taken from space is that you get green clouds, if they are mid grey, as these are the same as the pixel values of the land. You can only have, of course, one colour assigned to each grey level. It is of course possible to recolour in PCX format, etc, a WXSAT picture by individually changing each pixel on the image to another colour. This is possible with some of the better paintbrush packages, such as Publishers Paintbrush, etc. But of course, most of the original information is lost and you are simply doing the equivalent of tinting an old black and white print.

False Colour Imaging

You will probably recognise this process from the astronomical pictures you see published in science magazines. If you see the original B&W image consisting of 256 grey levels, and then the false colour image beside it, you will see the reason for its popularity. Bands are set up, for ranges of grey levels, i.e. 0 to 30 blue, 30 to 60 red, 60 to 90 yellow, 90 to 120 green, etc. This often brings out and immense amount of detail, impossible to see

on the B&W image. By dragging these pairs of bars up and down, the image changes dramatically. You can make a palette up to show the different types of clouds, Cirrus, Cumulus, etc. by this method.

Conclusion

As each image received has a different range of grey levels, a new palette is required for each to bring out the very best. However, I use standard palettes for myself, for D2, CO2, C2D, etc. and these normally enhance the original image. They do give you a better idea of cloud thickness and cover on a D2 for instance. My palette consists of dark blue at the bottom, then grey, and white at the top. Experiment with that configuration, and you will find that you can produce a palette that will suffice for most of the D2 images.

As PCSAT3 uses 64 grey levels for its palette and 0 to 64 for each colour, and PROSAT II uses 256 levels and 0 to 256 for each colour, it is not easy to convert your old .PAL palettes to .PLT palettes. However there is a way. Rename your old .PAL to .PLT and load it into PROSAT II with a picture and call up "Set colours". Then select the uppermost bar and move it up until its value in the grey level box is four times its original number. Select "Change" and change each colour value to one four times the value. Repeat this with each bar. It may not produce a perfect palette, but it is a start, and you can use it with your old stored .DAT images, if you have just upgraded to PROSAT II. Those of you with PROSAT who want to downgrade your palettes from .PLT to .PAL can reverse the process, in Prosat package by dividing by four, and saving, before renaming the palette .PAL. The FCONVERT program, which only merges .DAT and .PAL (not .PLT) can then be used.

Converting .DAT and .NOA images to GIF format

We are getting asked this one nearly every day. There is an unpublished, until now, command that has been left in the Prosat and PCSat software that answers all your prayers. **"ALT S"** If you have a good image you wish to save, together with its palette, and maybe also in a zoom mode, you can now execute a screen-save with the ALT S command. Your picture will be saved exactly as you see it on the screen, together with the Menu bar and the Mouse pointer (You did remember to move this to the top right of the screen, out of the way, didn't you!). The programs save a file in the current directory as SCR0001.SC(F, etc.) The extension will depend on the video mode you are running the program in. It will be saved as .SCF if in 640x480x256 or if you use 1024x768x256 you will have to rename the extension to .SCO.

If you want to arrive at a 640x480x256 GIF picture but always run the program in a higher mode, simply change with "SETMODE" to the lower mode, load in your file and press ALT S. This will be saved in the lower mode. You have now created a RIX format file, .SCF, .SCO, etc. This can be viewed in VPIC (on Disk 99) and converted to GIF by pressing "G" in the display mode. If you wish to erase the menu bar, load the GIF into the Image Process shareware programme (on Disk 99) and use the tools to erase the top few lines, and then use the text option to label your image.

(Please note: the ALT S command is not officially supported by Timestep, although it appears to work with most video boards).

Since I started writing this article I have received from another member a Shareware program called VGACAPTURE v.8.0. It will do a screensave in a variety of VGA modes, and then convert to GIF format, from any screen (WXSAT or any other program). It is reviewed in Shareware Corner.

FOR SALE...

Dartcom Scanning VHF Receiver, in case with LED channel indicators and PSU £140.
Dartcom downconvertor £120
YU3 Framestore £200
Homemade 1 metre dish and feed £10
VDU £10
I prefer not to split, therefore total package normally £480 for £390 O.N.O
Contact Peter Jones, Tel: 0564 823406 (Midlands M40/M42 junction)

FOR SALE...

Timestep colour framestore 5 years old - excellent condition - little used £200.

Contact John Wills, 20 Pemberton Gardens, Chadwell Heath, ROMFORD Essex. RM6 6SH (Tel: 081 590 5275)

ALL THAT'S VAS

Tom Glembocki

Here is an executive summary of what it takes to get into VAS reception without reading any of the other stories on the subject in this issue and without wading through any of the technical nitty gritty details. The block diagram above illustrates the hardware pieces necessary.

The VAS data stream originates from the Geostationary GOES satellite and consists of infrared and visible images sent as part of the same block of information. Your receiving equipment is supposed to be smart enough to separate the IR from the visible and display the appropriate image.

Resolution is .8 Km per pixel, the highest of all commonly available image sources. As a comparison, HRPT has 1.2 Km per pixel, APT has 4 Km per pixel and Wefax gives 8 Km per pixel.

When you try to scan the whole earth disk using a resolution of .8 Km per pixel what you are looking at is a big blue marble that measures 15,000 pixels wide and 15,000 pixels high. This is 225 megabytes worth of image. Given the limitations of today's garden variety desktop computer, what you really want to do is pick a comfortable size area of the globe to look at that fits into your computer. North Carolina fits on my 1024 x 768 Super VGA screen and the other 8 megs of RAM in my computer can hold an area from the Mississippi River to the Atlantic coast and from the Canadian border to Cuba. The software allows scrolling around this area (or any other area captured into RAM). The satellite takes about 20 minutes to scan the whole disk, with a new scan starting at the North Pole at one minute and 31 minutes past the hour, 24 hours per day.

To receive the signal you need:

1. A big dish - 10 foot is minimal, 12 foot is adequate. A used TVRO dish is excellent.

2. A good low noise figure LNA, as much under a db as you can afford. Greg Ehrler has a good one for $175. Mount it on the side of a 2 lb coffee can.

3. An S band downconverter that will cover the VAS frequency of 1687.1 Mhz. Some 1691 Mhz WEFAX units are broad enough to cover this frequency - check with your downconverter vendor. Quorum makes an excellent unit for $550.

4. A BPSK receiver with receive crystal to match the frequency output of your downconverter.

5. A VAS Frame Processor with PC interface card to decode the digital data.

6. A 286 or better PC with at least 4 megs of RAM. Hard disk is not required but nice to have.

VAS reception and display software.
With the dish aimed at one of the GOES birds (there are several to choose from), enter the acquire menu and select your offset into the line, the number of pixels to skip, the block ID's desired and the number of pixels to grab per line. We want the visible image so will select blocks 4 through 11.

I want to look at the California coast, so an offset of 5000 is about where California is on the earth disk (0 is the left earth edge and 15,000 is the right edge.). I want California at full resolution so the skip is 0. To get the whole earth disk which is 15,000 by 15,000 for example, I could choose a skip of 8 and offset of 0 which would give me the full globe measuring less than 2,000 by 2,000.

The other parameter left is the line width. From experience I know the United States is over 6,000 pixels wide but if I try to capture an image 6,000 pixels wide my 8 megs of RAM will run out in 1300 lines! By choosing 2,000 pixels wide I get enough image to get a strip a little wider than California and a length starting at the North Pole continuing to the Baja.

Now wait until 1 or 31 minutes past the hour, press enter and instantly the image begins filling memory and appearing on the screen at 20 lines per second. When memory is full or you've received all you want to examine, escape from acquire and go into the View menu to scroll the image, zoom, adjust contrast, brightness. The image could also be Filed or Printed as with normal APT/WEFAX products.

Thats it! Of course, all of this comes at a price. VAS reception and image processing costs are much higher than APT and WEFAX but are comparable in cost to HRPT.

The barrier to VAS has always been price, just as it once was for HRPT. Commercial VAS systems from aerospace companies today average

$300,000 to $800,000. HRPT, once available only from aerospace companies, used to start at $100,000. Vendors such as Quorum and Timestep have lowered that barrier to under $3,000, making it affordable to hundreds of individuals. This now is the first of the VAS systems reaching down to that pricing level, allowing it to now be available to a wider audience than before.

Tom Glembocki is an Electrical Engineer in Network Systems Design for a large computer company and is also the Editor of WeatherSat Ink, 4821 Jessie Dr, Apex, NC 27502 USA. Subscriptions are $20 per year ($15 US) payable in US funds or MasterCard/VISA. FAX: 919-362-5822

FOR SALE...

512k PARADISE VGA Graphics card with s/ware drivers and manual £30 Also FREE to a good home. A box and a half of paper for the Telecopier 400 fax machine (approx 150 sheets).

Contact J. Beardmore on 0536 515874.

1.2M steel dish with Meteosat dipole/reflector feed and mounting frame - £30. Buyer collects.

T.H.Bratton, Leicester. Tel: 0533 607681 anytime.

ICS FAX1 Weather Facsimile/Navtex/RTTY demodulator £80
ERA Mk.2 Microreader Morse Code/RTTY reader £60
Misco Parallel intelligent printer buffer 4 way £80
All have their original instructions complete.

John Mason Tel: 0733-346556 (Home) 0832-274460 (Work).

REMOTE IMAGING GROUP

Statement of Accounts for the Year Ended 31 December 1991

9 Park Lane, Bulmer Tye, Sudbury, Suffolk

REMOTE IMAGING GROUP

Balance Sheet as at 31 December 1991

ASSETS EMPLOYED	Balance 1/1/91	Addns	Depn	Balance 31/12/91
FIXED ASSETS				
Equipment	2477	2439	1637	3279
CURRENT ASSETS				
Stock			7800	
Debtors			481	
Cash at Bank			8627	
Cash in Hand			278	
			17186	
CURRENT LIABILITIES				
Creditors			1305	
Corporation Tax			98	
			1403	
NET CURRENT ASSETS				15783
				£19062
FINANCED BY				
CAPITAL ACCOUNT				
Balance 1 January 1991				9723
Less: Correction to Bank Balance at 1 January 1991				(662)
Surplus for the Year				10001
				£19062

REPORT of the AUDITORS to the MEMBERS of REMOTE IMAGING GROUP

We have audited the accounts on pages 1 and 2 in accordance with approved accounting standards, and we have carried out such procedures as we consider necessary.

In our opinion, the accounts, which have been prepared under the Historical Cost Convention, give a true and fair view of the state of the Club's affairs at 31 December 1991 and of the result for the year ended on that date.

47A High Street
Halstead
Essex
CO9 2JD

Maurice Lake & Co
Accountants and
Taxation Consultants

3 March 1992

(1)

REMOTE IMAGING GROUP

Income and Expenditure Account for the Year Ended 31 December 1991

Sales			32649
Subscriptions			8940
Commission Received			215
Advertising			733
Donations			211
			42748
Less:	Opening Stock	3823	
	Purchases	27150	
	Closing Stock	(7800)	23173
			19575
Add:	Bank Interest Received - Gross		393
			19968
Less:	Secretarial Expenses	138	
	Newsletter Printing	4105	
	Telephone	798	
	Postage and Stationery	2368	
	Rally Expenses	221	
	Insurance	185	
	Bank Charges	14	
	Accountancy	250	
	General Expenses	153	
	Corporation Tax	98	8330
			11638
Less:	Depreciation of Fixed Assets		1637
Surplus for the Year			£10001

(2)

THE GIF PICTURE LIBRARY

MIKE GOODALL

The following are available at present:
Disk 1 UK Noaa: in colour (x5)
Disk 2 UK Noaa: most in colour (x5)
Disk 3 Americas: various (x9)
Disk 4 Americas: various (x8)
Disk 5 Americas: various (x7)
Disk 6 Space: Spaceman, Launch, Mars, Venus, Saturn (x5)
Disk 7 Earth: various HRPT, plus GMS4 (x8)
Disk 8 Russian Meteor: Various (x5)
Disk 9 Various (x9)
Disk 10 Russian Meteor: USA (x3) [640x600x256 levels]
Disk 11 AusGMS and Noaas (x4) [up to 800x600x256 levels]
Disk 12 Mets and Noaas (x4) [up to 800x600x256 levels]
Disk 13 HRPT: Italy and Greece (x6)
Disk 14 SW Pacific (x5)
Disk 15 HRPT (Peter Hayes article, RIG29)
Disk 99 Shareware versions of viewing and tracking programs (zipped)
Disk 99A Shareware versions of viewing and tracking programs (zipped)
All pics are in PC GIF format; mostly 640x480x256 levels. Some are up to 800x600x256 levels. (All VPIC compatible.)

You will need a viewing program to see the files; VPIC is recommended for starters. It is supplied on Disk 99 in zipped form. To use zipped versions of any of the programs... make a directory or subdirectory on your hard disk where you want the program to reside (i.e. C:\VPIC) and unzip it into the directory as follows: PKUNZIP <filename.zip> <Hard drive letter:\directory or subdirectory> (i.e. PKUNZIP VPIC46 C:\VPIC). Next read the Doc and Readme files to enable you to configure it to suit your video pcb and machine.

How the system works: All disks will be copied for members free of charge, providing blank formatted disks are sent to me, with return addressed label and return postage. ***Maximum of 6 disks at any one time.*** Please send extra stamps or £1 coin (average donation) to enable me to return overseas members' disks post free. Whilst most members are generous in this respect, some continually send nothing extra. We don't really want to make larger charges, like the Shareware companies do; so it's up to you!

Overseas Members: As above, but return post is free. I would appreciate any polar orbiter GIF files you have for the Library.

Most Library disks have approx. 1.2Mb on them; the best format to send is 1.4Mb HD 3.5". All other PC formats, 1.2Mb, 720kb and 360kb, can be copied to. Only legal PC formats. None of those drilled out 720kb etc.

Have any of you Gif, or other format, files of Okeans and Fen Yun for the library? It doesn't matter how good they are as long as they are identifiable.

THE SOVIET & CHINESE SCENE

PETER WAKELIN

A new name appears under the title of this column this time. Hopefully, Les Currington will be fully recovered in time to write for the September Newsletter.

METEOR 3-4 has been the prime source of imagery from non-American polar orbiters during recent months and has transmitted some excellent pictures on 137.30 MHz in both the infra-red and visible spectra. The polar regions have always fascinated me and this satellite has provided the opportunity to monitor the break-up of ice at high latitudes in recent weeks. The northbound infra-red evening passes in February showed the ice at its maximum extent and as extremely cold air cannot hold much water, cloudless skies are common. During March the northbound passes precessed through the afternoon towards midday and together with the northward movement of the sun, illumination increased rapidly and some stunning visible light images of the Barents Sea islands were available.

I monitored the almost overhead pass of METEOR 3-4 on April 6th and noticed that the binary edge-code, which is a measure of the imaging lens aperture, remained at its minimum value of 10 until the satellite passed over central Spain when it jumped to 25 then resumed its normal increase. A few minutes earlier the satellite had passed over the western Sahara where the sun was directly overhead and it seems likely that the optical system could not cope with the intense reflection from the sand. I have observed this phenomenon over the Arabian desert from Bahrain with the early Meteor 2's when, on occasions, the imaging system was switched off to avoid possible damage. Now in late April and for much of the Summer, northbound passes are in the mornings and most of the northern hemisphere is transmitted in daylight.

METEOR 3-5 has been mostly silent recently but several observers heard signals on 23 March on 137.40 MHz and Geoff Perry heard it on 9 April also. Nothing has been heard from OKEAN 3 for some months now. It was recently in continuous sunlight for 26 days and I monitored regularly in case it should spring to life with fully charged batteries. Now that METEOR 3-5 has transmitted on the OKEAN frequency I think it reasonable to assume that no OKEANS are in service. The same is probably true for the FENG YUN satellites. I am unaware of any signals on APT frequencies from these objects recently.

Images from the METEOR 2 series are still available on 137.85 MHz. METEOR 2-20 has recently taken over from 2-19 but has developed synchronisation problems.

[STOP PRESS - I heard METEOR 3-3 again on 5th May on 137.40, Mike]

KEPLER ELEMENTS

MAX WHITE

	NOAA 9	NOAA 10	NOAA 11
	137.62 MHz	137.50 MHz	137.62 MHz
	84-123	86-73	88-89
EPOCH OF DATA	92122.16419633	92119.22910175	92119.22568183
ACCELERATION	0.00000616	0.00000579	0.00000705
REV NO.			
INCLINATION	99.1455	98.5391	99.0773
R. A. NODE	148.1243	140.1023	82.1898
ECCENTRICITY	0.0014266	0.0014471	0.0012048
ARG OF PERIGEE	246.4035	87.0712	162.1397
MEAN ANOMALY	113.5615	273.2152	198.0169
MEAN MOTION	14.13384015	14.24644571	14.12675193

	NOAA 12	MET 2-16	MET 2-17
	137.50 MHz	137.85 MHz	137.30 MHz
	91-32	87-68	88-05
EPOCH OF DATA	92121.60079912	91283.02197901	92120.64174564
ACCELERATION	0.00000815	0.00000127	0.00000193
REV NO.		20934	
INCLINATION	98.6992	82.5544	82.5443
R. A. NODE	152.1511	269.9326	167.8390
ECCENTRICITY	0.0012488	0.0012811	0.0015583
ARG OF PERIGEE	332.5362	354.4558	204.2072
MEAN ANOMALY	27.5145	5.6457	155.8358
MEAN MOTION	14.22020009	13.83839899	13.84633192

	MET 2-18	MET 2-19	MET 2-20
	137.30 MHz	137.85 MHz	137.85 MHz
	89-18	90-57	90-86
EPOCH OF DATA	92121.80167527	92121.42998321	92121.80936895
ACCELERATION	0.00000225	0.00000073	0.00000211
REV NO.			
INCLINATION	82.5193	82.5444	82.5249
R. A. NODE	43.6698	106.2153	44.4541
ECCENTRICITY	0.0013017	0.0015363	0.0014681
ARG OF PERIGEE	250.0072	164.1167	66.6929
MEAN ANOMALY	109.9688	196.0485	293.5784
MEAN MOTION	13.84279433	13.84118490	13.83490961

	OKEAN 2	OKEAN 3	MET 3-2
	137.40 MHz	137.40 Mhz	137.30 MHz
	90-18		88-64
EPOCH OF DATA	92027.17472953	92030.41210581	92122.11488758
ACCELERATION	0.00002052	0.00002459	0.00000210
REV NO.			
INCLINATION	82.5282	82.5239	82.5389
R. A. NODE	274.0320	180.2252	153.5378
ECCENTRICITY	0.0019169	0.0022577	0.0018380
ARG OF PERIGEE	154.5401	208.0568	48.2137
MEAN ANOMALY	205.6753	151.9570	312.0550
MEAN MOTION	14.76532435	14.74754786	13.16949694

	MET 3-3	MET 3-4	MET 3-5
	137.85 MHz	137.30 MHz	137.85 MHz
	89-86	91-30	91-56
EPOCH OF DATA	92121.36249229	92121.69617961	92121.54703890
ACCELERATION	0.00000043	0.00000043	0.00000441
REV NO.			
INCLINATION	82.5469	82.5516	82.5567
R. A. NODE	96.1145	359.4278	305.9340
ECCENTRICITY	0.0017139	0.0018557	0.0014198
ARG OF PERIGEE	63.4327	344.9628	345.7508
MEAN ANOMALY	296.8577	15.0951	14.3139
MEAN MOTION	13.15993846	13.16806093	13.16808712

ALL KEPLERS ARE THE LATEST AVAILABLE AT TIME OF GOING TO PRESS

TIMESTEP BULLETIN BOARD

There is now operating, 24 hours a day, a Bulletin Board that you can use to download Keplers and get other information regarding latest developments in the Weather Sat scene. The Keplers are updated every Friday and are in Amsat and 2-line format, plus IT.ORB for Instantrack.

The number is 0440 820002, and the protocol is the normal standard 8 bit, no parity, 1 stop bit.

SOVIET REFERENCE ORBITS

SIMON GOODALL

These are the times of north bound equator crossings (in GMT) and longitudes (in degrees west) for four Soviet satellites. They are given at weekly intervals together with the period and the change in longitude per orbit.

MET 2-19

period 104.10 minutes increment 26.15 degrees

20 JUN 11.10 011	27 JUN 09.43 002	04 JUL 08.16 352	11 JUL 08.34 009
18 JUL 07.07 000	25 JUL 05.40 350	01 AUG 05.57 007	08 AUG 04.30 358
15 AUG 04.47 015	22 AUG 03.20 005	29 AUG 01.54 356	05 SEP 02.11 013

MET 2-20

period 104.14 minutes increment 26.16 degrees

20 JUN 06.56 008	27 JUN 05.34 000	04 JUL 04.11 352	11 JUL 04.33 010
18 JUL 03.11 002	25 JUL 01.48 353	01 AUG 02.10 011	08 AUG 00.47 003
15 AUG 23.42 001	22 AUG 22.20 353	29 AUG 22.41 010	05 SEP 21.19 002

MET 3-4

period 109.41 minutes increment 27.48 degrees

20 JUN 03.32 358	27 JUN 03.18 006	04 JUL 03.04 015	11 JUL 01.01 355
18 JUL 00.47 004	25 JUL 00.33 012	01 AUG 22.11 350	08 AUG 21.57 358
15 AUG 21.43 007	22 AUG 21.29 015	29 AUG 19.26 356	05 SEP 19.12 004

MET 3-5

period 109.41 minutes increment 27.48 degrees

20 JUN 23.38 355	27 JUN 23.24 003	04 JUL 23.10 011	11 JUL 21.06 352
18 JUL 20.51 000	25 JUL 20.37 008	01 AUG 20.22 016	08 AUG 18.18 357
15 AUG 18.03 005	22 AUG 17.49 013	29 AUG 15.44 354	05 SEP 15.29 002

DON'T HOLD YOUR BREATH...

Following the article by Gordon Flemming, extolling the virtues of the new Martelec Frame Store unit, which appeared in the Newsletter a couple of issues ago, we have been advised that there will be a delay in getting it onto the market.

The problem arises because of the unavailability of the special type of memory chip that was used in the prototype. This will mean a re-design of this part of the circuitry. The final product is unlikely to be ready for several months.

METEOSAT DISSEMINATION SCHEDULES

We are occasionally asked for updated schedules, and although these rarely change, a photocopy is now available from the Chairman, Henry Neale or the Newsletter Make-up Editor, Mike Goodall. Please enclose a stamped addressed envelope.

UPGRADES...

PC-SAT3 Upgrade disk. July 91, as mentioned in RIG24, including MET3-4. £3.00 handling charge, state disk size required.

PROSAT-II Upgrade disk, (March 92) including F10, F12, increased resolution on Russian Mets when saved as section, plus a new good HP type Laser/Bubble-Jet print routine, plus minor fixes. £3.00 handling charge, state disk size required.

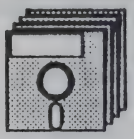
SNOISE, Signal to noise measuring program for Meteosat (for ProsatII system only) Send disk and return S.A.E.

TIMESTEP HRPT DEMO DISK, 1.4MBt. £3.00 handling charge.

All available from the Chairman.

SHAREWARE CORNER

MIKE GOODALL



VGA CAPTURE v.8.0

This program looks like the answer to all those dreams. How do you enhance and/or colour, and zoom in on a WXSAT picture and convert the whole screen to a GIF image retaining the palette and zoom features? VGA CAPTURE seems to do it all. A small amount of TSR is required (about 2KB) and by pressing ALT-f2, etc. (a different key combination for each VGA mode) it will save a file of raw data (called SCREEN00.RAW) and a palette file (called SCREEN00.PLT) of your picture exactly as seen on the video screen. Assumably you can save up to 99 of these pairs of files (if you have enough disk space) as the file is incremented each time (00, 01, 02, etc.). It will work with all the VGA formats from 320x200x256 up to 1280x1024x16 (including the now popular 1024x768x256), and leaves all its files in the current directory. Although mainly of use for WXSAT images, it can be used on any screen within a program provided the screen-save command does not conflict with the program key commands - a CTRL-ALT combination can also be selected to help to overcome this. It could be useful for taking screen-shots for reviews of software, etc. You have the option of saving your screen file in the BIOS mode which takes a minute or two or in the direct mode (up to ten times faster) which uses specific chipset based commands. You then exit to DOS (make sure you are in your original directory) and call up the VGAFIL program which needs to be in the PATH. Select the required image from the Menu screen, and press return to convert your raw data image with its palette file into the GIF format. Your final GIF image is also saved in the current directory. The program can also save your screen file in BMP, TIF, TGA or PCX formats. It is available on the Gif Library Disk 99A.

Remember... all the Shareware, etc. on Disks 99 and 99a can be downloaded from the RIG Bulletin Board.

Remember, shareware is not free. If you use it, please register it! This helps to promote updates from the authors; many of whom spend six months or more perfecting their programs. Another bonus is the User Manuals normally sent when you register, which contain a mine of useful information. In addition, the authors will normally try to sort out any problems that arise with their programs when used with your specific set-up.

MEMBERS' LETTERS

[Any letters sent to the Editor, Make-up Editor or Committee are assumed to be available for publishing in the Newsletter, unless otherwise specified.]

Dear James,

I joined the Club about a year ago, as I had a general interest in meteorology and electronics since being at school. I do not have a satellite receiver nor am I a radio ham, my prime interests in electronics being with instrumentation and computers. Our house has many of the latter.

My main reason for joining was to get an understanding of what remote sensing was all about, one aim being to perhaps buy/make equipment and joining in. The former I have already started by understanding the acronyms! My main interest is not so much in receiving pictures themselves, but rather in monitoring changes in climate/land surface, if this is possible. To do this I think one needs to know two things;

1) What are the satellites measuring? Obvious for a visual picture, but what about the infra-red, and what does this mean in terms of atmospheric and surface temperatures. What are the accuracies of these measurements? In brief, the physics behind the measurements being made;

2) How does one get at the raw data behind the pictures, so that it can be interpreted by a computer? Presumably it can be picked up from a data file if the file structure is known.

Is it possible to have an article(s) on these topics, with guidance on which are the best systems to buy for this sort of work. Maybe there are books out there, but all I have located are either, 'a child's guide', or ones which assume you have a PhD in mathematics and atmospheric physics.

Rodney Stubbs, Berkhamstead, Herts.

Dear Ed,

I have been a reader of RIG newsletters from issue No.1 and I must say that the current issue is a great step forward in presentation etc. There is a point

I would like to raise for consideration. I should think that the members are in 2 camps, those that are also radio Amateurs and those who are not. I think a Bulletin Board is available for news for those who have the necessary modem and are prepared to further swell the coffers of BT. I don't fit in either case.

Now as you may or may not know, there exists a huge network of Bulletin Boards across the country, in fact across the world, and this is there for the use of radio types, many of which are also RIG members. What I am suggesting is that use is made of this facility, it is of course free of charge and will cover the whole country in 24 hrs. I would like to see it used for Stop Press news. I for one am never sure just which satellites are operative at any particular time, and I would welcome up to date news of which, say, of the Meteors are in action. There are those among the members who are able to glean this info, either with their particular skills, or due to their work and this info could be distributed to a large number of our members.

It may be that those who have the info are not the same ones who are in a position to upload this info onto the Bulletin Boards. I am in a position to do that if the info was passed to me. It is a thought that might well be considered.

Now to something different. In the past pages of the Newsletter I saw the offer by Les Hamilton, of copies of his programme for Orbit Predictions. I took advantage of his offer and would like to say now via these pages what a really fine programme it is. If anyone is in need of an excellent programme this is to be recommended. I do not know a lot about programming, but I do know enough to appreciate the good work put into this. Whereas a lot of programmes will print a long column of figures, this one will utilise the whole page, thereby saving paper. This is just one of the many little things that go to make it superior.

Just to wish you all the best,

Ivan Cline, Canturbury, Kent.

Dear James,

I agree with the letter in RIG 28 (page 70) from Paul Matley regarding more technical articles. They may have been published in the past but I would like to see:

1. How to adapt a standard fax machine to receive signals from an RS232 output from a PC;

2. A detailed article on the technical aspects of the satellites themselves and particularly a description of the varying tone shades/bars/"curly bits" and black and white bands which appear on the edge of the images. Why for example does METEOR 3-4 have a different set of bars when on Vis to I/R? I have a Dartcom series 2 system that syncs up fine on the Vis system but not at all on the I/R.

3. Further details on the 'picture construction' in the satellite itself. For example, in an earlier article Henry made a comment about shining a light in the air as NOAA9 passed (a joke I presume)..*[You don't know Henry - Ed!!]* but it raises the question if one pixel covers a ground area of (say) three by three kilometres and 80% of that area is dark and 20% is light, will the pixels show as white or black?

With regard to the suggestion at the AGM concerning local groups, I think it is a very good idea and would be happy to organise a group in my area.

Brian R. Taylor, Woking, Surrey.

Dear James,

Although I have been a RIG member for a few years now, I am a comparative newcomer to the PC world. My unfortunate experiences over the last few days may assist someone not to make the same mistake as I did.

If you use a 'life sensitive' programme such as 'Track II', i.e. you can only install the programme on a HD twice without un-installing it, then under no circumstances archive the HD to floppies without un-installing this programme. MS Dos 5 was in use. I cannot vouch for other versions of course.

The unfortunate result of archiving it is that neither the HD or the archived versions will work! This means using your last life on the original to continue in business, hoping for no further problems.

Disaster was to strike sooner than expected though! I was experimenting saving Sat images, each time the computer totally locked up and had to be

switched off in order to get it going again! After about 5 attempts the computer failed to restart correctly due to the HD being full, and obviously corrupted. Each time I had had a previous lockup, huge chunks of disk space were earmarked for the Sat image, but remained invisible and untitled because of the system crashes! The information option came up with the amazing news that I had 14Mbytes of invisible files. They could not be located and erased because they had no titles. Even XTree Gold could not locate them! The only course of action was to format the HD and use the archive disks to set the system up again. This meant that having used both lives up on Track II, the programme no longer worked! The lesson to pass on is that under no circumstances try to archive programmes with limited lives, un-install them first!

Peter Stonebridge, G8ZQA, Ipswich, Suffolk.

[All those who have been in touch and asked for duplicates have been supplied by Timestep]

Dear Henry,

Regarding your query in RIG as to the construction of the LNA, I still haven't finished mine, but I wonder if you supplied chip capacitors or FLEAS. They are quite active and seem to be able to disappear at will!!!

Colin Schulz, Apia, Western Samoa.

Dear Ed,

Henry's, Mike's and your requests for articles etc. for the newsletter have been so successful that this letter in its original form, although in time for the deadline, had to be left out due to it being filled up a week early. It is updates, and even now (3 weeks early), it'll just squeeze in (Please!) Take note everyone, don't sit on your ideas until the last minute like I did in case the goal posts have to move because of a glut. You'll get crushed in the rush!

BIRD WATCHING

In RIG27 Henry mentions watching weather satellites going over. When I bought my first VHF/UHF scanner, I set it to scan for them, also navigation satellites (around 150 mHz and 400 MHz), Salyut 7 and the space shuttle

(both were too bright to miss). My wife and I used to see who could spot the source of the signals in the sky first as they passed over, she usually won as she has keener eyesight than me. She is definitely not a satellite fanatic, this was a temporary aberration and she's alright now. I sometimes think this hobby is all male territory as most of the RIG articles are by men.

BIRD CATCHING

I wonder if the new generation of sensitive CCD imagers being used for astronomy could work with a wide angle lens, perhaps pointing at a mirrored ball or dome, to capture the tracks of all these passing satellites (also aircraft lights and meteors) using a computer to draw the trails on the screen. The apparatus needs rotating constantly around polaris every 24 hours approximately, to keep stars as points. The computer could be programmed to ignore anything but points of light, such as the moon, light pollution and passing clouds. There was an 'etch-a-sketch' programme in March 1988 'Micro User', something like that could be adapted to draw lines. Around the same time a programme called 'Space Birds' for the IBM PC and compatibles was advertised in 'Astronomy'. It predicts the naked eye visibility of near earth satellites against the constellations. This would help identify the objects observed by the CCD. Write to:
Astronomical Data Service,
Space Birds Visibility Programme,
PO Box 26180,
Colorado Springs, CO 80936
The price then was $40.00. Manual only, $5.00

I've not tried these programmes as I don't have the right computers. A small advert in a relevant magazine may yield 'Space Birds' if it is not available new. Watch out for viruses!

The Gulf War TV coverage showed up night time activity in the sky, and stars were sometimes visible, but image intensifiers may have been used. English Electric Valve (EEV) in Chelmsford supply image intensifiers to the military. Where can I get one surplus? I saw a small type about 2" diam. on tomorrow's world for detecting bio-luminescence in plants. The following companies sell CCD arrays, EEV, Tektronix, Thompson CSF, Mullard/Philips, Fairchild, Sony, Hitachi etc.

I've seen no articles on capturing moving objects in the whole night sky, just imaging for telescopes. I'd do one myself if I wasn't computer illiterate. The latter point probably explains why I am not that keen on computer based weather satellite displays that take five minutes of menu searching

and keyboard tapping to get one picture on the screen and print it, while pressing one button on an old fax machine will do a very respectable job at modest cost, especially if it has some analogue, TTL or CMOS image enhancement circuitry added. *[Perhaps Graham could invent a one push button method of getting his written contributions in to the magazine to save hours of keyboard tapping and mouse bashing! - Ed]* Helix and 3 styli printers even let you see the picture as it is being built up.

LITERATURE & LIBRARIES

If you are interested in the space programmes of various countries or are a scanner enthusiast, take a look at 'The table of artificial satellites launched between 1957 and 1976' and its updates, published by 'The International Telecommunication Union', in Geneva. You may have to go to a university library to find it in their science reference section. First ask by phone if they take a magazine called 'Telecommunication Journal'. The update pages to the loose leaf table were published in each issue until last year. I spent many fascinating afternoons in 1986 finding out what frequencies spacecraft have used, right back to Sputnik1. Most frequencies are printed, except the ones not known at the time of publishing I assume, and highly secret ones. The lay out is similar to a well known book.

'The RAE table of earth satellites 1957-1989' (Fourth Edition) which is now published by RAE Farnborough ISBN 0-9516542-0-9
It lists orbital parameters and gives dates of launch, lifetime, mass, shape, size etc., of all the main parts achieving orbit, fragments are mentioned also. Price is £135 inc. VAT (Post Free in UK £15 outside) You also get the supplements for 1990 and 1991 when available and list of amendments for the objects that have decayed. It is available from:
Alan Winterbottom,
WS Dept,
R14 Building,
Defence Research Agency (Aerospace Division),
R.A.E. Farnborough,
Hants GU14 6TD Tel: 0252 24461 Ext. 3727

Geoffrey Falworth sent me a leaflet about 'Spacecraft Tables 1957-1990' by Jos Heyman ISBN 0-912183-07-1 $60 + $6.0 mailing and handling was a low prepublication price, but I don't think they've changed it yet. Address is:
Univelt, Inc.,
PO Box 28130
San Diego, CA 92198

Some copies of 'Communication Satellites' by Larry Van Horn are available (Though it may be out of print). Price is £10 post free - cheaper than mine a few years ago. I reviewed it in RIG 18. Send money to Geoffrey Falworth, 15 Whitefiled Rd., PENWORTHAM, Preston PR1 0XJ.
An SAE will bring you information on 'Satellite News', an approximately monthly record of space activity (including frequencies), cost is £2.50 ($5.00) per issue post free worldwide. Add $10.00 to U.S. cheques and money orders to cover U.K. bank charges. Some back copies are available at reduced prices. Ask for his long list showing space related literature for sale. Older copies of RIG Newsletters might even turn up there.

A useful book for RIG members to obtain is 'Telegraphy' by R.N. Renton. Last published by Pitman in 1976 ISBN 0-273-40846-1 Hardback or ISBN 0-273-00085-3 Paperback. It has 50 pages devoted to analogue facsimile, with descriptions, block diagrams, circuits, and internal diagrams, mostly of Muirhead machines. There is also a teleprinter section. Another book worth looking at is 'Fax - The principles and practices of facsimile communication' by Daniel M. Costigan. Published in 1971 by Chilton. ISBN 0-8019-5641-2. It deals with the history of fax, shows many different methods of scanning and printing, has many photos of machines (some manufacturers I had never heard of) and gives details of their standards. There is plenty of Bibliography at the end of most chapters, some reaching back to pre-first world war. I obtained this book after reading G4EAN's review in BARTG's Spring 1988 'Datacom' magazine. If you're more interested in the history, look at their Autumn 1987 issue. As the two books are out of print, you'll have to order them through your library. While you're there, don't forget to look in the British technology index, current technology index and clover index. Choose a year and subject e.g., 1971 Weather satellites, meteorology, facsimile etc. This will give you references to magazine articles on our hobby. Many of these back copies can be obtained fro you by your library from the National Lending Library at Boston Spa. A quicker alternative is to ring Boston Spa lending Library on 0937 843434 and they can tell you the nearest place that keeps what you want (if your library doesn't already know). E.G. they told me that 'Radio Constructor' January 1967 is available for reference at the British Library in London WC2 Tel: 071 323 7494. The article was about amplitude modulating a fluorescent tube at audio frequencies - has possibilities for a photographic fax printer. They also have the ITU satellite list mentioned earlier. They need a day or two's notice for some items, so ring first.

A very good source of novel ideas for scanning, light modulation, motor synchronisation, FM tape recording etc., is the 'Narrow Bandwidth

Television Newsletter'. Some techniques used for mechanical TV can be used in slow-scan TV and satellite imaging. Membership of the Narrow Bandwidth Television Association is £4 a year and you get quarterly newsletters. Recent back copies are £4 a volume (1989 and before are £3 a volume). They've certainly had the cogs whirring in my head over the years. Of course you can always make a working low definition mechanical TV camera from a spinning record in a biscuit tin or a rotating mirrored polygon, which is what it is all about. For more information contact Doug Pitt at 1 Burnwood Drive, Wollaton, Nottingham, NG8 2DJ Tel: 0602 282896. For membership and back copies contact Dave Sumner (G3PVH) at 20 Woodlands Way, Southwater, Horsham, Sussex RH13 7HZ. One service to their members is identifying obscure CRT's, so if you were hoping to use one for a dedicated satellite display as in the ARRL Handbook, and can't get information on it you may be in luck.

A torch bulb can be used for optical communications and there have been many articles over the years on how to do this. Transmitting speech or music over a fair distance. Basically an audio amplifier drives a light bulb that is biased on by a D.C. current through it. It could be used to mark a bromide paper on a fax drum, when focused. Tungsten bulbs suffer from thermal inertia so that there cannot respond very rapidly to the signal the way a laser or crater tube can, but if the drum is slowed down to one tenth normal speed or much less, it shouldn't be such a problem, and the bulb will have more effect on the paper. See 'A Print Recorder' by I.R. Lee in Practical Electronics January 1965. Photocopies are £2 per article from Intra House, 193 Uxbridge Rd., London W12 9RA Tel: 081 743 8888. This is the same address and phone number as 'Astronomy Now' which has articles on CCD's. Their back copies are £2. or £1.50 (Inc. VAT + p&p) per article for photocopies. Back to light bulbs. Some kind of slow playback recorder is needed for this. A computer memory could play it back at any speed (See RIG 27 p.46 and p.50). It would take several hours to replay one pass, using a slow synchronisation motor, but unless the pictures are required immediately for weather forecasting, that doesn't really matter. Once developed, fixed and washed, you will have a permanent picture for your effort very cheaply. Also get the 'Engineer's Mini Notebook' - Communications Projects' by Forrest M/Mims III, from Tandy shops. A biased on ultra-bright LED could be tried (Yellow,green or blue if you're rich). neons aren't really the right colour for this work unless you use 7774 dry silver paper from 3M, and heat it to 127 deg.C for approx 10 secs. (It's usually exposed with a helium/neon laser). If you'd like a sample to try let me know. For modulating lasers, see 'Electronics Today International' May 1991. Photostats per article are £1.50 per article from Argus Specialist

Publications, Argus house, Boundary Way, Hemel Hempstead, Herts HP2 7ST Tel: 0442 66551. They've been putting an index in recent issues covering projects from the last 20 years.
This letter has digressed and snowballed a bit, but I try and plug some gaps between the absolute beginner and the state-of-the-art high-tech stuff, with a mix of ideas and snippets of information relating to space and weather satellites, I hope it produces some thought and activity in the hobby.

Graham Smith (G1JVZ) 91 Oakdene Avenue, Chistlehurst, Kent BR7 6DZ Tel:081 857 3106

P.S. I did enjoy the April fool about NOAA 13's new halogen headlights... What do you mean it wasn't a joke?

Dear James,

Three things have prompted me to write to you. Firstly, to thank the committee for their efforts which have led to the production of the RIG newsletter in its present excellent form.

Secondly, I would like to comment on the articles by Roger Belcher, which have appeared in the last two editions of the newsletter. While not wishing to denigrate the effort which has been put into these, I would comment on the fact that their contents seem either to be very simple and ideal for the beginner, or very advanced, leaving a void of information, the bridging of which would be welcomed by many readers. Another point is rather more serious.

Referring to the equations which appear on page 51 of the March 1992 issue. Some of these are wrong, and the overall presentation may confuse anyone interested in the practical implications of Doppler shift. The errors cause the result to be somewhat pessimistic. Let me explain.

A typical speed of a NOAA satellite is about 7446m/s, somewhat lower than the 8000m/s quoted. Even the late lamented UOSAT-1 at about 500km altitude had a speed of just over 7600m/s, which is still much lower than 8000m/s. This is the first reason why the final Doppler shift is too large. Following this comes the first of two statements which are meant to clarify the numbers involved, and which are actually quite incorrect, although the author has chosen the correct figure with which to do his calculations! I refer, of course to the statement that the speed of light is

300.10E6 metres per second, or 300,000,000m/s. The last number is correct, the first one is not! If anyone is still confused, the symbol "E6" is shorthand for "times (10 raised to the power of 6)". Now, 300 times $10*10^6$ is 3,000,000,000m/s, which is wrong by a factor of ten. The shorthand version 300.1E6 or, better still, 300E6 is the correct version. Anyone who has been using this incorrect form on his calculator and wondering why his results do not agree with the text, can now rest easy!

The table below has been constructed to show typical figures relating to satellites at different altitudes. The columns are self-explanatory except, perhaps, for those showing α and $\cos(\alpha)$. These refer to the diagram below, which is used to explain my criticism of the Doppler calculations on page 51. The diagram shows (not to scale) the earth of radius R, and a satellite in a circular orbit at an altitude h above the earth. The speed of the satellite is v, and the line which is tangential to the earth and is also a chord of the satellite's orbit, is the horizon of the observer at P. When the satellite is at S, it is just rising over the observer's horizon. The Doppler shift is caused by the relative motion of the satellite with respect to the observer. Mr Belcher has chosen to ignore this fact, and has used the full velocity of the satellite (which is too large) in his calculations. Whereas I am all in favour of a worst-case analysis, I hope my worst case is never that of a satellite coming directly towards me at 8000m/s!

From the diagram, the relative velocity that causes the Doppler shift is the component of v in the direction SP. This is given by the function

$$V = v * \cos(\alpha),$$

and $\cos(\alpha)$ is given by

$$\cos(\alpha) = \frac{R}{(R + h)}$$

This means that the relative velocity, V is now given by:

$$V = \frac{vR}{(R + h)}$$

Once V is known, we can calculate the Doppler shift either by Mr Belcher's formula, or by the simpler formula

$$\delta f = \pm \frac{V}{c} * f_o ,$$

Where δf is the Doppler shift,
c is the speed of light, and
f_o is the satellite signal frequency.

These equations are used to generate the values in the table below.

Mean radius of the earth	6371	km
Propagation velocity	3.00E+08	m/s
Beacon Frequency	137.5	mHz

Mean altitude (km)	Mean radius (km)	cos(α)	α°	Satellite Speed (m/s)	Maximum Doppler Shift (Hz)
500	6871	0.9272	21.99	7617	3237
550	6921	0.9205	23.00	7589	3202
600	6971	0.9139	23.95	7562	3167
650	7021	0.9074	24.85	7535	3134
700	7071	0.9010	25.71	7508	3101
750	7121	0.8947	26.53	7482	3068
800	7171	0.8884	27.32	7456	3036
850	7221	0.8823	28.08	7430	3004
900	7271	0.8762	28.81	7404	2973
950	7321	0.8702	29.51	7379	2943
1000	7371	0.8643	30.19	7354	2913

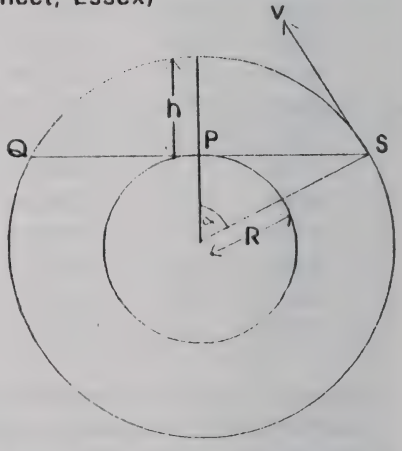
It is now worth noting that when the satellite is at S, the Doppler shift as measured by the observer is at its maximum value, and the shift then decreases to zero when the satellite is directly overhead at P, after which it continues to fall, finally reaching its maximum value negatively as it sets over the opposite horizon at Q. For example, take a satellite at 800km altitude: its maximum Doppler shift is 3036Hz; this means that, as it rises at S, the received frequency is 3036Hz above the true carrier frequency; as it sets, the received frequency is 3036Hz below the true carrier frequency.

To return to the exposition on page 51, the calculated Doppler shift, by virtue of the excessive speed used, is 3667Hz, producing a contribution to the IF amplifier bandwidth of 7334Hz. The table above, and the entry for 800km altitude, shows that this figure can usefully be reduced to 2 * 3036Hz, or 6072Hz.

You may not think that this error is worth the effort expended in writing this letter. You may be right, but I can well remember struggling to understand articles on satellites, and being unable to get the same answers as quoted in the text! So if I have saved just one person the frustration of not knowing where his mistake lay, I have not wasted my time. I have seen students spend hours entering expressions like 2*10E6 into their calculators, under the misapprehension that the number was 2,000,000.

Finally, may I enter a plea for the prefixes K and k to be used properly. k is the correct prefix for *1000, and K is the correct prefix for *1024. It is no use complaining that today's engineers are not as literate as they might be, if we constantly feed them with incorrect written data! K is correct only in computer contexts, where numbers tend to be in the powers of 2, and 2^{10} = 1024. For example, 2 kilobytes is written 2Kb, and means 2048 bytes. In electronics, it is always a lower-case k, 2kΩ meaning 2000 ohms.

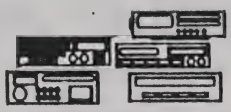
I apologise for nit-picking; perhaps it is because the standard of the RIG Newsletter is now so good that such errors become more noticeable! Keep up the good work. Dr. G. Brown (Benfleet, Essex)



[The author of the article, Roger Belcher replies..]
I must first thank Dr. Brown for taking the time and trouble both to read and reply to the articles on the VHF receiver. I do appreciate comment, discussion and criticism. To take Dr. Brown's points in order:
1) The article does consider some aspects of the receive system in greater depths than others. The intention was to give more information & background on the parameters and effects most relevant to the particular application - weather satellite reception. If readers would like further information or analysis on any areas 'glossed over', I will do my best to respond.
2) Dr. Brown is quite correct with respect to his comments concerning the indicated speed of light. It was an error on my part to include 10 in the 300.1E6 expression and does indicate an excessive speed of light. I apologise for this error.
3) The intention of the section on IF selectivity was to demonstrate how a final bandwidth could be arrived at for the receiver. I wanted to show that although the Doppler shift does have an influence on the bandwidth it is a lesser effect and so I took a simplistic approach. This does give an error, albeit less than 5% in the overall bandwidth. It was not my intention to cause confusion to any readers and I thank Dr. Brown for his further analysis of Doppler shift.

Remember... All Member's Letters direct to James Brown, please!

THE NEALE'S GUIDE
TO SECOND HAND EQUIPMENT PRICES



This guide is intended as a reference to expected second-hand equipment prices when sold between members and at rallies, etc. It can only be approximate, due to age and varying condition of equipment.

FRAMESTORES (YU3 TYPE)
SINGLE PAGE, uncased £150.00, cased £200.00 upwards
FOUR PAGE, uncased £200.00, cased £240.00 upwards

PCSAT3 SYSTEM (Members Price, New £52.00 incl. P&P)
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PROSAT II (Members price, New £122.00 incl. P&P)
Clean £100.00

OMNIFAX (New price £201.19 inc. P&P)
In good cond. £140.00 upwards

AMIGASAT PACKAGE (New price £165.41 incl. P&P)
In good cond. £110.00 upwards

DARTCOM (RIG) DOWNCONVERTER (New price in box £183.00)
In good cond., no corrosion £120.00 upwards

MICROWAVE MODULES DOWNCONVERTERS
Working cond. £40.00 average

DARTCOM SCANNING RX, LCD DISPLAY (New price, unboxed £169.00)
Smartly boxed £180.00 upwards
AS ABOVE, BUT LED CHANNEL READOUT (New price, unboxed £128.00)
Smartly boxed £140.00 upwards

CIRCUIT VHF RX (New price, around £40.00)
Boxed, working, £30.00 approx.

DISHES (New price with mounts and feed £70.00 - £75.00)
Clean cond. £30.00 upwards, depending on cond. size, feeds, mounts, etc.

This has only been an attempt at producing a guide. Perhaps you could advise James of actual deals and if you agree with our prices.

RIG AT RALLIES

Below is a list of rallies attended by RIG last year. We hope to see you again at these events this year, but if you are in doubt over any event, please give the Chairman a phone call.

June 14	Elvaston Castle
June 28	Longleat
July 5	York
August 2	Woburn Abbey
September 13	BARTG - Sandown
September 20	Peterborough
October 23-24	Leicester

We are always pleased to see volunteer members at these events, especially those who live local to the event, who can help on the stands, and give the regulars a small break during the day.

A quarterly publication for hardware, software and applications of WEFAX, APT, VAS, HRPT and GOESTAP.

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4821 Jessie Drive, Apex, NC 27502, USA

$15 US per year $20 all others, US funds
MasterCard/Visa OK with $1 surcharge

RIG HELPLINES

General Enquiries Meteosat information NOAA information Supplier Complaints	John Tellick	081 390 3315

A copy of the Group Rules can also be obtained from John Tellick

Russian, Chinese satellite information/status	Les Currington	0707 326058

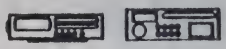
Schools Education Co-ordinator		John Tellick	081 390 3315
Schools/	John Murray	Torquay	0803 217754
Educational Enquiries	Frank Bell	Godalming	0483 416897
	Tom Walter	Reading	0734 871330
	Bob Coombes	Haslemere	0428 642930
	John Din	Bristol	0454 773387

Framestore Technical Support	Mike Coombs (7.30pm-9.30pm)	0530 243494

RIG MICRO SPECIALISTS:

PC and Compatibles	Dave Cawley (after 6.30pm)	0440 820040
BBC Micro	Enquire via John Tellick	081 390 3315
Commodore Amiga	Chris Pretty	0420 82752
Atari ST, Archimedes	Peter Newman	0487 812121
PCSAT3 and PROSATII	James Brown	0656 782632
HRPT and Primary Data	Dave Cawley	0440 820040

RIG SHOP CORNER



All prices shown include post and packing except where marked

Receiving Equipment	UK Price	Overseas Price
RIG DARTCOM Meteosat Downconverter. Assembled and tested module in tin plate box	£147.00	£126.00
Complete, assembled and mounted in weather-proof box.	£183.00	£158.00
RIG DARTCOM VHF Scanning Receiver. Assembled and tested module, with LED channel number display.	£128.00	£110.00
As above, but with LCD frequency read-out instead of LED channel number display.	£169.00	£145.00
Both the above items are modules and require a box, together with several components, switches, etc.		
RIG TIMESTEP Receiver. 2 ch. 137.50-137.62MHz. Ready built and boxed, requiring only 12Vdc, low level audio out, 2400 tone squelch detector, very compact, channel change by remote grounding switch. Ideal for dedicated Downconverter IF. A chance to release your Dartcom scanner RX!	£57.00	£50.00
	Special Rally Price	*£55.00*
New, but surplus to manufacturers requirements. Limited to one per member.		
RIG TIMESTEP PROscan Receiver. 8 ch. (6 crystalled, 2 spare) Ready built and boxed, requiring only 12Vdc and speaker. 2400 Tone squelch detector.	£164.00	£141.00
	Special Rally Price	*£160.00*
RIG VHF Preamp. Includes a bandpass filter and is ideal for mast-head mounting. Assembled and tested module, only needs boxing.	£16.00	£15.00
RIG 1695MHz Low Noise Amplifier kit. *Experienced constructors only.*	£28.00	£25.00

Computer Software/Hardware

RIG TIMESTEP PCsat III, IBM/PC Comp. System.	£ 52.00	£ 45.00
See main advertisement.	*Special Rally Price*	*£ 49.95*
RIG TIMESTEP PROsat II, IBM/PC Comp. System.	£122.00	£105.00
See main advertisement.	*Special Rally Price*	*£120.00*

Antenna systems

RIG CROSSED DIPOLES
A Turnstile type design, in kit form *(available in UK only)* incl. P&P £24.00
Special Rally Price £18.00

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1.6 Metre, used condition. £48.00

90 cm active area, complete with feed horn and mount, £70.00
including dish to 2" (50mm) pole bracket.

The above prices are for collection from the Chairman, or by prior arrangement from Rallies. For delivery quotation ring Mark Clarke on 0787 74128 evenings only between 7.00 and 9.00pm, Fax 0787 475029 or write for a quotation to 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ. For further details see RIG28 page 9.

RIG Binders

Available by post from Gordon Fleming, 168 Bythway, Welwyn Garden City, Herts. AL8 1DU. UK Price £4.00 each, European Price £4.50, Outside Europe Price £5.00. Cheques to *"REMOTE IMAGING GROUP"* please.

Back Issues of RIG Newsletters

	Rally Price	UK Price	Europe Price	Outside Europe Price
RIG 8-11 1987	£4.00	£5.00	£5.50	£6.50
RIG 12-15 1988	£4.00	£5.00	£5.50	£6.50
RIG 16-19 1989	£4.00	£5.00	£5.50	£6.50
RIG 20-23 1990	£5.00	£6.00	£6.50	£7.50
RIG 24-27 1991	£5.00	£6.00	£6.50	£7.50

Note: Prices quoted are for a set of four, including Post and Packing.
RIG 1-7 are currently out of print. Individual issues are no longer available (hardship cases excepted).

Ordering Information

All items are available from the Chairman, Henry Neale (except where marked) and include return by UK 1st class mail (except dishes and Newsletters). Euro overseas sent via Airmail printed paper rate.

UK prices include VAT where applicable, receipts issued upon request. Channel Isles and Isle of Man, divide by 1.175 to remove VAT content.

UK members, By Cheque or Postal Order. Overseas members, Pay by Bank Draft (drawn on a UK London-based bank) or Eurocheque (Payments to a Maximum of £100.00 in any one Eurocheque). No local currency please.

All cheques made payable to *"REMOTE IMAGING GROUP"*.

RIG - Timestep PCsat III

This is a low cost solution to Weather Satellite Imaging on PC type computers. Although extremely low cost it handles all known APT satellites. It supports all known VGA video cards in all modes. It will automatically animate up to 100 frames and is in use by over 1,000 people throughout the World !

Satellites

We cover all known satellites: NOAA, Meteor asynchronous, Meteor synchronous, Okean asynchronous, Okean synchronous, Feng Yun, Meteosat and GOES. Most importantly there is no Doppler bending of the edges of the image, even from tape ! We deliberately do not use crystal control for the Soviet series as this produces bad doppler bending and no signals at all from tape. Quite simply the handling of Polar satellites is superb ! It is possible to receive GOES (just) in the UK, the transmission standard is slightly different, this is why we do not compromise and have a special setting for GOES.

Animation

Animation is crucially important to satellite enthusiasts. Some systems allow you to animate AFTER the images have been received. We call our system "Stand Alone Animation"; you simply set the computer and walk away. Each image is automatically received and animated. Without touching the computer at all, every time you walk past you will see the latest sequence of frames automatically animating ! Animation is smooth, fills the whole screen and is completely flicker free. You only need 640K of memory as the storage is on your hard disc. Animation is standard, not an option.

Video Cards

We support ALL video cards in ALL modes. Depending on the card used it is sometimes necessary to view the image in different modes after reception. Although we fully support 1024 x 768 x 256 this really needs a 20" monitor to do justice. With 14" monitors the pixel size is less than the shadow mask aperture, so you end up losing data. By far the best mode is 800 x 600 x 256, this gives an non-interlaced flicker free display.

Computer requirements

You can use ANY VGA card in ANY mode, a 286 or better will give the best results. A hard drive is recommended. MS DOS is preferred and all features are available on a 640K memory machine.

Due to the World Wide success of our PROsat II system we have decided to reduce the price to beginners to just

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Henry Neale RIG Chairman
Thornlea Fishergate Sutton St James
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RIG - Timestep PROsat II

This system provides the look and feel of Windows 3, image processing, 3D, NOAA Gridding, NOAA temperature calibration and full data from NOAA and the Soviet series in a huge 2.4MB file. Reception of ANY satellite can be in ANY VGA mode !

Satellites

We cover all known satellites: NOAA, Meteor asynchronous, Meteor synchronous, Okean asynchronous, Okean synchronous, Feng Yun, Meteosat and GOES. Most importantly there is no Doppler bending of the edges of the image, even from tape ! We deliberately do not use crystal control for the Soviet series as this produces bad doppler bending and no signals at all from tape. Quite simply the handling of Polar satellites is superb ! It is possible to receive GOES (just) in the UK, the transmission is slightly different, this is why we do not compromise and have a special setting for GOES.

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NOAA Gridding and Temperature and Resolution

If you are not sure why these features are important we suggest you read the review in RIG 26 by Rev James Brown. Quite simply you can point to a spot on the image and read its temperature directly, no ground truth data required ! The Gridding will overlay the image with latitude and longitude lines. The mouse is interactive and will give spot lat and long. Combined with temperature, it is possible to simultaneously read latitude, longitude and temperature. This incredible program will store ALL of the data received during a polar pass, both visible AND infrared in FULL resolution. Any area of either sensor can be analyzed in full resolution; you do not have to decide before the image what you want to see.

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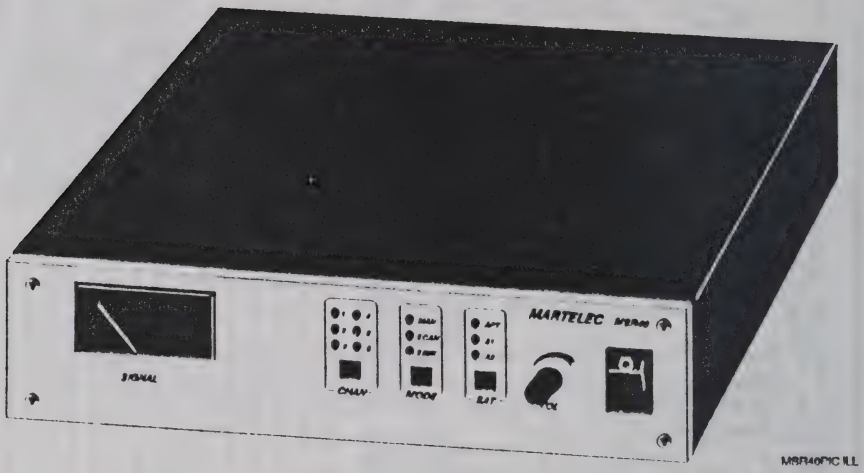
MONITORS : 14" VGA Mono £85, 14" VGA colour £199
14" Super VGA colour £215, 14" Multiscan Colour £265
FLOPPY DRIVES : TEAC 360/720Kb £48, 1.2/1.44Mb £51
HARD DISKS : SEAGATE ST251-1 40mb 28ms £175, 42Mb IDE 25ms £128.

Please call for further information on systems and components (Day/Evening)
All prices EXCLUDE VAT. Delivery - 5 Days (Components), 10 Days (Computers).

Introducing the MSR40...



When it comes to interference rejection – there is only one receiver

The result of 12 month's intensive R & D, and rigorous testing, the all new MSR40 is a truly outstanding performer. Designed in accordance with the principles set out in Roger Belcher's authoritative article (RIG27), and fully conforming with his specifications for the highest possible level of interference rejection, this receiver is the measure by which others will be judged.

Housed in a custom-designed aluminium enclosure, the MSR40 is both attractive and rugged. Inside, its rigorously designed and tested circuitry ensures that you have the highest performance currently available. If you would like to know more about the MSR40, please call or write.

Features:

- *Extremely high interference rejection capability (> + 13dBm)*
- *Fully synthesized*
- *Attractive, compact design*
- *Remote control facility*
- *Mains or DC power*
- *Separate inputs for Meteosat and VHF inputs*
- *Meteosat downconverter power via coax feed*
- *Signal level meter*
- *Intelligent Search and Scan modes*

The MSR40 is sold on a money-back gaurantee basis.

Price £295
(excl. VAT & carriage)

Martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton, Hampshire GU34 3AW, U.K. Tel/Fax 0420 82752

OMNIFAX 4.0

Facsimile or Weather Sat?

Both! In one package, Omnifax gives you the software and interface card for both facsimile and wxsat reception. This latest version of Omnifax has even more features and improvements and represents superb value - especially if your interests span both weather satellite and facsimile recption. The package contains a comprehensive interface card for the demodulation of ***all*** satellite and facsimile modes. In addition, the interface contains all the necessary hardware for the optional SSTV and CW/RTTY/ASCII packages.

Separate inputs are provided for fax and wxsat, enabling the permanent connection to their respective receivers. Omnifax runs on any AT machine (286, 386, 486) and some faster XTs (10MHz and faster)

Facsimile Reception

Probably the most comprehensive system ever offered for the reception of facsimile transmissions - decoding all standards found on VLF, through to UHF, including amateur fax, press fax (incl. colour), meteorological charts etc. The package provides automatic scrolling, and caters for IOCs of 144, 264, 267, 353, and 576 and drum speeds of 60, 90, 120, 180, and 240rpm. There is software shift selection to allow for 1900 + 400Hz or 1900 + 150Hz signals. The drumspeed reference is quartz stabilized for accurate and stable image framing, and the images may be scanned in any of four directions.

Weather Satellite Imaging

Decodes Meteosat, NOAA, Meteor, Okean, Cosmos etc. with all sync tones detected. IMages are displayed in either EGA, VGA, or SVGA formats with excellent clarity and definition. Images are decoded and stored in full 8-bit resolution. The system features fully automatic reception capability, programmable timer, multi-sequence animation, and superb printer dumps for laser and dot matrix printers.

Price £169.36

(Price excludes carriage at £4, and VAT)

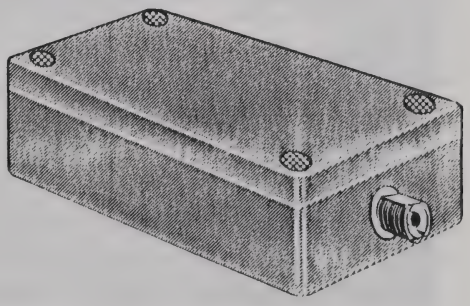
MSC30

LOW NOISE DOWNCONVERTER

We believe our new MSC30 Downconverter is quite simply the best you can buy. This completely new design uses the ultra-low noise 32184A HEMT front-end, and GaAsFET mixer to achieve state-of-the-art performance. The new model is now offered either in a tinplate box or enclosed in a hermetically sealed diecast metal box for outdoor use.

Features:

- *Low noise HEMT front end - 0.7dB typ.*
- *High output drive level for long cables (Gain 55dB typ.)*
- *Precision crystals with temperature control*
- *Can now be powered either via signal coax or separate lead.*
- *Complete with all connectors and dish cable. (Cased version)*



Prices

In Weather-proof Box £160

In Tinplate Box£135

Amateur communication systems

The Acorns, Wyck Lane, East Worldham, Alton, Hampshire GU34 3AW, U.K. Tel/Fax 0420 82752

ATARI
WEATHER
SATELLITE
DECODER
AVAILABLE
NOW
Compatible with European, Soviet and American satellites
Entire image stored in maximum spatial resolution
Time lapse animation of weather systems
Automatic "hands-off" data collection
Compatible with 520ST to Mega4 ST
Receiver control from software
2D and 3D Histogram plot
False colour or 4 bit greyscale
Printer support
Many powerful utilities
Frames may be exported to Art packages
Analogue zoom with fast pan over entire image
Infra-red and visible light images with cross-fade
From 13 to 146 frame animation depending on model
spacetech
space science resources

21 West Wools, Portland, Dorset DT5 2EA. U.K. Tel. 0305 822753 Fax. 0305 860483

PC or ANY other system ? Part III

Feature	PC	ANY other system
Screen resolution	1024 x 768 x 256	
Grey levels displayed	64 grey and 256 colours	
Grey levels stored	256	
Animation	up to 100 frames	
Save image in full resolution for later use	YES	
Printer facility using laser printers	YES	
NOAA and ALL Polar satellites	YES	
Meteosat and ALL Geostationary	YES	
NOAA HRPT option	YES available now	
Meteosat PDUS Primary Data	YES available now	
Cost to upgrade per 1 Megabyte	£29.00	
Cost to upgrade to 40 Megabyte hard disk	£135.00	
Runs industry standard software	YES	
RIG PCSAT III Software included	YES	
Total cost INCLUDING PCSAT III software	£599.00	
Completely built including mains plug	YES	

We firmly believe that the PC is the best solution for Weather Satellite use. The on screen resolution of 1024 pixels, 768 lines and 256 colours is superb. The ability to add memory at just £29.00 per megabyte is incredible. The 40 Megabyte hard drive at £135.00 is amazing. HRPT and Meteosat Primary data will work on the PC AND we can demonstrate this NOW !

Why don't you look carefully at other systems, add ALL the costs and see how they compare.
Fill in the details on this page. Check carefully that the new Soviet Meteors and Okeans are fully covered. Check that you can see HRPT and Primary Data working NOW, we all know what "we are working on it" means. Check that everything is in stock. Check on the availability and price of upgrades. Ask other users and RIG members. Then and only then decide what your future in weather satellites is going to be !

What do you get ? A 386 16Mhz computer in a real metal case with a 200W full spec power supply. 2 serial ports and 1 parallel port. A full AT keyboard. 1Mb of RAM. A 1.44 or 1.2Mb drive. A 1024 x 768 x 256 colour ET4000 video card. MS-DOS 5.0. RIG PCSAT III card and all software. In fact a fully featured 386 computer and RIG PCSAT III ready to go.
The 386SX motherboard will **DIRECTLY address up to 16Mb** of cheap on board memory.

1024 x 768 x 256 shop soiled 0.28mm pitch colour monitors £129.00 carriage £10.00

1024 x 768 x 256 ET4000 1Mb video cards £99.00 carriage £5.00

In line with our competitors, the prices in this advertisement do not include VAT at 17.5%

Timestep
Wickhambrook Newmarket CB8 8QA England
Tel. 0440 820040 Fax. 0440 820281

Timestep HRPT

Noise free digital HRPT transmissions from NOAA, with a ground resolution of just 1.1KM allow images to be received in incredible clarity. Rivers, lakes, mountains, cities and even small towns can be seen on good days.

Image Processing including variable and histogram contrast equalisation combined with full colour editing give the best possible results from any image. Colour enhancement allows sea surface temperature and land details to stand out in high contrast. Any number of colour palettes can be saved for future use. The sophisticated mouse driven software allows all 5 bands to be saved and displayed on nearly all VGA and SVGA cards right up to 1024 pixels, 768 lines and 256 colours.

Zoom to greater than pixel level is available from both a mouse driven zoom box or using a roaming zoom that allows real time dynamic panning.

Latitude and Longitude griding combined with a mouse pointer readout of temperature in 10 bit data is now provided.

We are offering the complete receiver and PC card for just £499.00, you will need a 1.2M dish (and a way of moving it), a low noise preamplifier, cable and a 286 or better computer with SVGA and a hard drive. This offer is limited. Don't wait, be first !

£499.00

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The World of Weather

As well as complete systems, Timestep allow you to buy all the parts separately. The quickest and least painful approach is simply to buy a complete system. Take your time and take advantage of our RIG special prices (UK only), you will save some money ! The parts you will need assuming you are using the IBM type PC approach are :-

Meteosat

Meteosat is probably the best place to start. It sends images constantly. Remember you do not need a NOAA receiver if you use our Meteosat Receiver (designed to work only with a preamplifier). This will free your NOAA system to look for the Soviet polar orbiters, something every satellite enthusiast should be doing !

Timestep products (world prices)	Britain	Europe	USA	RIG UK Members
1.0M dish antenna and feed horn	£164.95	£215.00	N/A	£139.95
Meteosat P-HEMP (essential)	£184.00	£210.00	$350.00	£124.95
20M cable	£ 19.95	£21.00	$ 69.95	£ 16.95
Meteosat receiver	£199.00	£225.00	$399.00	£169.95
PCSAT III interface card	£199.00	£225.00	$299.00	Henry Neale
PROsat II card and software	£399.00	£425.00	$399.00	Henry Neale
PCSAT III connecting cable	£ 14.95	£ 19.95	$ 29.00	£ 9.95
Dish feed (coffee can type)	£ 49.95	£ 58.50	$ 99.00	£ 29.95

Superior Pager Resistant Receiver !

or your money back !

Now many RIG members have pager free reception on their new Timestep receivers. Why not join them ? The scanning receiver covers all known satellites including the complete Soviet series.

Crossed dipole antenna	£ 54.95	£ 65.00	$ 99.00	£ 39.95
NOAA pre-amplifier	£ 29.95	£ 34.50	$ 72.00	£ 24.95
50M cable	£ 39.95	£ 42.00	$139.95	£ 34.95
PROscan receiver	£299.00	£325.00	$560.00	£249.95 Check with Henry Neale
Track II, PC prediction	£ 29.95	£ 29.95	$49.95	£ 24.95

HRPT

6 channel complete receiver, pre-amp input, data output	£499.00	Special offer
PC Data card and software including gridding and temperature calibration and selective 10 bit data	£199.00	£499.00 the pair

Primary Data

PDUS data card and software	£399.00	£425.00	£299.00	Special offer
PDUS 2 channel receiver	£799.00	£825.00	£499.00	£499.00 the pair

All prices include VAT at 17.5% and carriage in Britain, and Air carriage to other destinations.

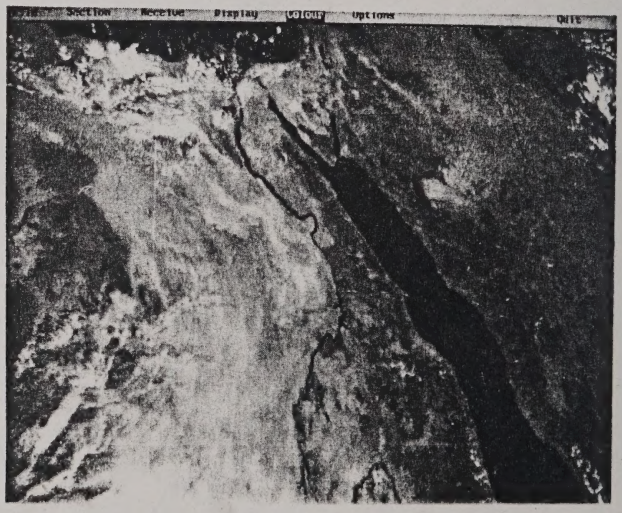
Timestep
Wickhambrook Newmarket CB8 8QA England
Tel. 0440 820040 Fax. 0440 820281

Timestep
PDUS

At last Meteosat Primary Data is available to the amateur. We believe that this i another World First for Timestep ! With the help of Dr John DuBois and Ed Murash we have at a stroke brought low cost digital imagery in to RIG members homes.

The Rev James Brown, Lawrence Harris and Peter Hayes have been the first users Wait with bated breath for their reviews; if you can !

NOAA, generally acknowledged as the best in imaging, has 4KM resolution on its APT transmission and is very infrequent. PDUS by contrast resolves 2.5KM at the sul satellite point AND transmits the whole of Europe every 30 minutes. The whole Earth Disc is transmitted at lower resolution every hour. Imagine looking at the River Nile ir 2.5KM resolution, the Aswan Dam is clearly visible as the deeper water shows as a much cooler temperature. Remember this is 2.5KM resolution, NOAA APT is 4KM and simply won't show the Nile anyway ! Look at the Amazon, the River Niger, the Volta rivers Lake Volta, Rain Forests and much, much more !



We are offering the complete receiver and PC card for just £499.00, you will need a 1.6M dish, a low noise preamplifier, cable and a 286 or better computer with SVGA and a hard drive. This offer is limited. Don't wait, be first !

£499.00

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